[Crown Copyright Reserved.]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION

ADDITIONAL SERIES IX.

THE USEFUL PLANTS OF NIGERIA.

PART IV.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased through any Bookseller or directly from
H.M. STATIONERY OFFICE at the following addresses:
House, Kingsway, London, W.C. 2, and 28, Abingdon Street, London, S.W. 1;
37, Peter Street, Manchester; 1, St. Andrew's Crescent, Cardiff;
23, Forth Street, Edinburgh;
from EASON AND SON, Ltd., 40 and 41, Lower Sackville Street, Dublin.

1922.

Price £1 Net.

QK1
.B9562
1922
v.9
PT.4

gift from Kew

QK1 .B9562 1922 v. 9 pt. 4

MONOCHLAMYDEAE.

NYCTAGINEAE.

MIRABILIS, Linn.

Mirabilis Jalapa, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 2.

Ill.—Rheede, Hort. Mal. x. t. 75; Rumpf, Amb. v. t. 89; Blackwell, Herb. ii. t. 404 (*Jalapium*); Plenck, Ic. t. 137; Batsch, Analyses Fl. Pl. Gen. t. 20; Schk. Handb. t. 41; Bot. Mag. t. 371; Lam. Encycl. t. 105; Drapiez, Herb. Amat. de Fleurs, viii. t. 540; Spach Suites (Hist. Nat. des Végétaux) t. 146; Ann. Sc. Nat. Paris, ser. 3, xviii. t. 16, f. 7 (seedling, anatom.); Martius, Fl. Bras. xiv. pt. 2, t. 81.

Vernac. names.—Gul A'bbas (Persia, *Dymock*); Shab-el-leila (Arabic, *Dymock*);—Nyctage Faux Jalap (*Planchon & Collin*), Marvel of Peru, Belle de Nuit, Four o'clock plant.

Lagos (Punch. No. 19, 1900; Rowland, 1890, Herb. Kew); widely distributed in Tropical Africa and warmer parts of the Old World. Native of Peru.

The roots, leaves and sometimes the whole plant are used for various medicinal purposes in India; the leaves are also used as a vegetable; the powdered seeds are used as a cosmetic in Japan and sometimes to adulterate black pepper (*Piper nigrum*) (Dict. Econ. Prod. India; Dymock, Pharmacog. Indica, iii. p. 132). The root was formerly used as Jalap (*Ipomoea purga*); Loudon (Encyl. Pl. (1829) p. 118) states that "the powder of these roots, washed, scraped and dried, is one of the substances which form the Jalap of the druggists." Used as a remedy for dropsy (Planchon & Collin, Drog. Simpl. i. p. 491). The leaves with other herbs soaked in cold water are used for a similar purpose in Lagos (Punch, Herb. Kew).

A crimson dye is obtained by steeping the flowers in water, used for colouring cakes and jellies made from seaweed, &c., Whampoa, China (Hance, Mus. Kew).

An ornamental plant 2–4 ft. high; perennial; may be propagated by seeds or division of the tuberous roots, and grows freely. The flowers—red, white, yellow or variegated—last only for a night, opening in the evening (hence the name, Four o'clock plant) and withering the next morning.

Ref.—"*Mirabilis Jalapa,*" in Dict. Econ. Prod. India, Watt, v. pt. 1, 1891, pp. 253–254.——*Mirabilis Jalapa*, in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 132–135.

BOERHAAVIA, Vaill.

Boerhaavia adscendens, *Willd.*; Fl. Trop. Afr. VI. Sect. 1, p. 4.

Vernac. names.—Babba juji (N. Nigeria, *Dalziel*); Azuigwa or Azaigwe (Awka, Agolo, S. Nigeria, *Thomas*); Embate, Bate-bate,

* (78)13721 Wt 33313—30/745 375 5/22 E & S A

Ditumbâte or Matumbâte (Ambriz, *Welwitsch*); Herba tostao (Portuguese, *Welwitsch*).

River Nun, Katagum, and distributed in Tropical Africa from Upper Guinea to Mozambique.

Used for soup, S. Nigeria (Thomas, No. 7, 1911, Herb. Kew); a decoction of the tuberous roots used as a remedy for jaundice, Angola (Hiern, Cat. Welw. Afr. Pl. i. pt. 4, p. 883).

A plant, 2–3 ft. high, with thick, woody rhizomes. A common weed in waste places, Katagum (Dalziel, No. 147, 1907, Herb. Kew).

Boerhaavia plumbaginea, *Cav.*; Fl. Trop. Afr. VI. Sect. 1, p. 6.

Ill.—Cav. Ic. t. 112.

Vernac. name.—Ab Libben (Arabic, *Muriel*).

Katagum (Dalziel, No. 196, Herb. Kew), and widely spread in Tropical Africa; found also in North Africa, Spain and Arabia. A decoction of the root used as a remedy for jaundice (Hiern, Cat. Welw. Afr. Pl. iv. p. 883).

Boerhaavia repens, *Linn.*, Fl. Trop. Afr. VI. Sect. 1, p. 4.

Ill.—Delile, Egypte, t. 3, f. 1 (*Var. minor*); Collett, Fl. Simla, p. 409, f. 131.

Var. **diffusa,** *Hook. f.*, l.c. p. 5.

Ill.—Rheede, Hort. Mal. vii. t. 56 ("Talu Dama"); Wight, Ic. Pl. Ind. or. t. 874 (*B. procumbens*); Mueller, Key, Vict. Pl. ii. f. 44 (*B. diffusa*); Turner, Forage Pl. Austral. p. 87 (*B. diffusa*).

Vernac. names.—Etiponla or Etikponla (Yoruba, *Millson*); Ipeca, Bourghoumy (French Guiana, *Heckel*); Hogweed, Pigweed.

Nupe, Lagos, Oshogbo, Katagum, and widely distributed in Tropical Africa; in Australia and India.

Used in Lagos as a pot-herb (Punch, Herb. Kew), "made into soup, Yoruba" (Kew Bull. 1891, p. 213); cultivated for the same purpose in India; root and leaves used in medicine (Dict. Econ. Prod. India), and various medicinal uses attributed to the plant in French Guiana (Heckel, Ann. Inst. Col. Marseille, 1897, pp. 98, 120); leaves given to hogs in Jamaica (Lunan, Hort. Jamaica, p. 377); a good forage plant for sheep and cattle (Kew Bull. 1909, p. 14).

A perennial plant, with woody rootstock and spreading stems; occurring over large tracts of both good and inferior country, Australia (l.c.); in hot sandy places, Loanda (Welwitsch, Herb. Kew.—type plant).

Ref.—"*Boerhaavia diffusa*, the spreading Hog Weed" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 485–486.——"*Boerhaavia repens*," in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 130–132.

BOUGAINVILLAEA, Comm.

Bougainvillaea spectabilis, *Willd.* Sp. Pl. ii. p. 348.

A climbing shrub, branches spiny; leaves alternate; infloresence painculate, pendant; bracts large, richly coloured rose, or in some varieties, brick-red; flowers insignificant.

Ill.—Gaertner, Fruct. Sem. Pl. iii. t. 216; Lam. Encycl. t. 294; Velloso, Fl. Flum. iv. t. 16 (*Josepha angusta*); Paxton, Mag. xii. p. 51); Rev. Hort. 1850, p. 161; Schnizlein, Ic. t. 104 (*Buginvillea speciosa*); Bot. Mag. t. 4810; Martius, Fl. Bras. xiv. part 2, t. 82.

Native of tropical South America; introduced to the West Indies and many other warm countries; naturalised at Banana, Lower Congo (Durand & Schinz, Études Fl. Congo, i. p. 231); introduced to Botanic Garden Old Calabar about 1897.

Grown for ornamental purposes; makes a good hedge plant; propagated by cuttings.

PISONIA, Linn.

Pisonia aculeata, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 8.

Ill.—Gaertner, Fruct. Sem. Pl. iii. t. 76; Lam. Encycl. t. 861; Sloane, Hist. Jamaica, ii. t. 167, ff. 3, 4 (*Paliura affinis*); Plumier, Ic. Burm. t. 227, f. 1; Blanco, Fl. Filip. t. 394; Wight, Ic. Pl. Ind. or. v. tt. 1763, 1764; Nuttall, N. Amer, Sylva, ii. t. 121; Bedd. Fl. Sylv. (Anal. Gen.), t. 22; Vidal. Fl. For. Filip. t. 76A; Thonner, Blütenpfl. Afr. t. 42.

Vernac. name.—Fingrigo (Jamaica, *Sloane*).

Lagos, Gold Coast, Uganda, East Africa, India, &c. Native of Tropical America and West Indies.

The bark and leaves are used as a counter-irritant in cases of inflammation and rheumatism; the juice mixed with pepper and other ingredients given to children for pulmonary complaints (Dict. Econ. Prod. India).

A climbing shrub with strong spines; well-adapted for making fences. Nuttall (l.c. p. 203) refers to the spiny branches forming thickets very troublesome to traverse and the glutinous capsules " which adhere to everything they touch " and Ussher mentions (specimen in Herb. Kew) having " found a bird lying helpless on the ground covered with the fruit of this creeper; its feathers all stuck together."

AMARANTACEAE.

CELOSIA, Linn.

Celosia argentea, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 17.

Ill.—Rheede, Hort. Mal. x. tt. 38, 39; Wight, Ic. Pl. Ind. or. v. t. 1767; Engl. Bot. Jahrb. xxx. 1902, t. 1, ff. A–B; Engl. & Prantl, Pflan. iii. part 1A, p. 93, f. D, p. 99, t. 51, ff. A.B.C.

Vernac. names.—Farin alayafu (Hausa, *Dalziel*); Soko Yokoto (Lagos, *Dawodu;* Oloke Meji, *Dodd*); Abore (Benin, *Dennett*); Rawodue, Tarbar (Sierra Leone, *Scott Elliot*); Ntcha-wodueh, Torbor, Shokotor (Gold Coast, Col. Rep. Misc. No. 1, 1891, p. 36); Sarwali (India, *Watt, Moloney*); Nogeito (Japan, *Woolley, Moloney*).

Lagos, Yola, Benin, Nupe in Nigeria and also occurring in Arabia, S.E. Asia, and Malaya.

A pot-herb, and eaten by cattle and buffaloes, India (Dict. Econ. Prod. India). The seeds are officinal being an efficacious remedy in diarrhœa (l.c.); used as a medicine in Japan (Woolley, Mus. Kew). An annual, 1 to 4 ft. high, a common weed; but sometimes cultivated—said not to be cultivated in Nigeria but used as a pot-herb there (Dalziel, Hausa, Bot. Voc. p. 7).

Celosia cristata, Linn. a cultivated state of *C. argentea* is grown in Loanda and has been introduced or run wild in many parts of the world (Fl. Trop. Afr. l.c. p. 18). This plant is well known in gardens as the "Cocks-comb." It is said (Agric. News, Barbados, 1917, p. 349) in an article on "Salads and Spinach" that "the best spinach of all the Amaranths is afforded by the young plants of Cocks-comb" and it is recommended to sow a bed thickly with the seed and cut the plants when about 4–5 in. high.

Celosia trigyna, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 19.

Vernac. names.—Nanufo or Nanafo (Katagum, *Dalziel*); Kagon (Uganda, *Cunningham*); Isiblaza (Zululand, *Hutchinson*).

Upper Guinea from Senegal to the Cameroons and widely distributed in Tropical Africa; found also in Madagascar and Arabia.

Used in Lokoja in the treatment of pustular skin eruptions (Parsons, Herb. Kew); as a medicine for tape-worm, Nigeria (Dalziel, Hausa, Bot. Voc. p. 77); a reputed cure for tape-worm, Uganda (Brown, Cunningham, Herb. Kew); leaves and flowers eaten in Zululand in times of scarcity (Kew Bull. 1898, p. 53); leaves eaten as a vegetable, Uganda (Speke and Grant, Herb. Kew).

A straggling annual, 1–4 ft. high; a common weed often in cultivated ground.

AMARANTHUS, Linn.

Amaranthus Blitum, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 35.

Ill.—Sowerby & Smith, Eng. Bot. xxxi. t. 2212; Rchb. Ic. Bot. Pl. Crit. v. t. 471; Fl. Danica, xiii. t. 2246; Zenker, Fl. Thuringen, vii. t. 73; Baxter, Brit. Bot. vi. t. 482; Syme, Eng. Bot. vii. ed. 3, t. 1177; Kerner & Oliver, Nat. Hist. Pl. i. p. 411, f. 104.

Wild Amaranth, Green Amaranth.

Onitsha, Katagum, Nupe, in Northern Nigeria; widely distributed in other parts of Tropical Africa and many warm countries.

The leaves are used as a pot-herb and the seed as a grain in India (Watt, Comm. Prod. India, p. 62—var. *oleraceus*).

An annual; found as a weed in cultivated ground, Onitsha; 6 in. high about towns in fields, Nupe (Barter, Herb. Kew); cultivated in India (Watt. Dict. Econ. Prod. India).

Amaranthus caudatus, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 31.

Ill.—Rchb. Ic. Fl. Germ. xxiv. t. 297, ff. 1–2; Engl. & Prantl, Pflan. iii. part 1A, p. 103, f. 56.

Vernac. names.—Efo (Lokoja, *Elliott*); [Alleyfafu or Alayafu (Hausa) Zakwondiam (Fufulde), *Dalziel*]; Ondi (Sierra Leone, *Scott Elliot*); Myene Afia (Eifik, Old Calabar, *Holland*); Jimboa (Loanda, *Welwitsch*); Ramdana (India, *Watt*)—Love-lies-bleeding.

Upper and Lower Guinea and more or less throughout Tropical Africa and in India.

Grain used in Tropical Africa for food; leaves eaten, Kampala, Uganda; seeds edible, cultivated at Layah (Scott Elliot, Herb. Kew); a native spinach, Yola, a red variety cultivated (Dalziel, Herb. Kew); cultivated as a pot-herb, Loanda (Hiern, Cat. Welw. Afr. Pl. iv. p. 886); used for salads, Old Calabar; cultivated in Africa for its leaves used as spinach (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 242), in gardens throughout the plains of India and cultivated by the hill tribes of India as a regular field crop on account of its grain (Watt, Comm. Prod. India).

The plant is an annual, 1–3 ft. high and in addition to its use as a vegetable, is of value for ornament; from the time of sowing the seed it comes to maturity in from 5–6 months.

Amaranthus polygamus, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 36.

Ill.—Rumpf, Amb. v. t. 82, f. 1; Wight, Ic. Pl. Ind. or. ii. t. 714.

Vernac. names.—Chumlar-sag, Doggali-kura, Pandi, &c. (India, *Hooper*).

Katagum; Togoland; British East Africa; Nyasaland and widely distributed in many warm countries.

Grown as a pot-herb in India (Dict. Econ. Prod. India; Hooper, Agric. Ledger, No. 6, 1904, p. 64); the leaves boiled with water and mixed with salt and chillies (Hooper, l.c.).

Annual, about 2 ft. high commonly cultivated.

Amaranthus spinosus, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 32.

Ill.—Rumpf, Amb. v. t. 83, f. 1 (*Blitum americanum*); Willd. Hist. Am. t. 4, f. 8; Desc. Ant. v. t. 314; Wight, Ic. Pl. Ind. or. ii. t. 513; Wood, Natal Pl. iv. t. 310; Rchb. Ic. Fl. Germ. xxiv. t. 297; ff. 3–5.

Vernac. names.—Imbuya (Natal, *Medley Wood*); Prickly Calalu (Jamaica, *Fawcett & Rendle*); Anapatza (Madagascar, *Baron*).—Prickly Amaranth, Prickly Caterpillar.

Upper and Lower Guinea and widely distributed in Tropical Africa, and in India, West Indies, Hawaii, &c.

Leaves eaten as spinach, Lagos (Moloney, Herb. Kew), West Indies (Agric. News, Barbados, 1917, p. 349), as a pot-herb in India (Hooper, Agric. Ledger, No. 6, 1904, p. 65). Various medicinal uses are attributed to the leaves and roots in India (Watt, Dict. Econ. Prod. India).

An annual, 1–3 ft. high often a troublesome weed. The sharp spines at the base of the leaves make it objectionable to stock. In Hawaii where the plant grows to about 5 ft. in height it has spread rapidly in pasture lands and strong efforts are being made to exterminate it (Hawaiian Forester & Agric. May, 1917; Agric. News, Barbados, 1917, p. 297); found by waysides everywhere and in cane-piece intervals, Jamaica (Fawcett & Rendle, Fl. Jamaica, iii. p. 130).

Amaranthus viridis, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 33.

Ill.—Willd. Hist. Am. t. 8, f. 16; Agric. Gaz. N. S. Wales, xviii. Oct. 2nd, 1907, p. 797; Rchb. Ic. Fl. Germ. xxiv. t. 298; Fawcett & Rendle, Fl. Jamaica, p. 131, f. 40.

Vernac. names.—Zaki banga, or Zaki banza (Katagum, *Dalziel*); Zete-Aleledaije (Oloke Meji, *Dodd*); Garden Calalu, Green Calalu (Jamaica, *Fawcett & Rendle*); Green Callalu (W. Indies, Agric. News, *seq.*).

Upper and Lower Guinea, other parts of Tropical Africa, and in many other warm countries.

A native spinach in Katagum where it is cultivated (Dalziel, Herb. Kew); eaten by the negroes, Loanda (Hiern, Cat. Welw. Afr. Pl. iv. p. 888), leaves make excellent spinach, West Indies (Agric. News, Barbados, 1917, p. 349), used, when other pot-herbs cannot be obtained, in India (Hooper, Agric. Ledger, No. 6, 1904, p. 65); tender tops eaten by the natives in India. though not so much esteemed as the cultivated sorts (Watt, Dict. Econ. Prod. India). Although pronounced a valuable vegetable and an excellent substitute for spinach, Maiden is of opinion (*seq.* p. 798) that it should not be conserved, even as a vegetable.

An annual, 1–3 ft. high, a common weed.

Ref.—" A Pig-Weed (*Amarantus viridis,* L.) " in " The Weeds of New South Wales," Maiden, Agric. Gaz. N. S. Wales, xviii. Oct. 2nd, 1907, pp. 797–798.

Aerva, Forsk.

Aerva lanata, *Juss.*; Fl. Trop. Afr. VI. Sect. 1, p. 39.

Ill.—Gaertner, Fruct. sem. Pl. iii. t. 213; Wight, Ic. Pl. Ind. or. ii. t. 723.

Vernac. names.—Ewe Aje (Lagos, *Dennett*); Ewe Owo (Lagos, *Dawodu*); Alhaji (Hausa, *Dalziel*).

All Tropical Africa, Asia and Philippines.

Used by natives as spinach, East Africa (Speke & Grant, Herb. Kew), leafy shoots of the young plant used in curry and the whole plant occasionally used as a famine food in India (Hooper, Agric. Ledger, No. 6, 1904, p. 63).

A shrub; white flower, Lagos (Dennett, Herb. Kew), grows shrub-like over low huts, covering them like ivy, flowers small white or mould colour, found near water and on ground once cultivated, East Africa (Speke & Grant, Herb. Kew); villous or pubescent, 1–4 ft. high, branches often long curved (Fl. Trop. Afr. l.c.).

The flowering tops are officinal and the roots are used in the treatment of headache on the Malabar Coast and the woolly spikes are used for stuffing pillows in Sind (Watt, Dict. Econ. Prod. India). [In the Museum at Kew there is a sample of the flowers of "Toorf" (*A. tomentosa*, Lam.) stated to be used for stuffing cushions, mattresses, &c., in Jedda].

ACHYRANTHES, Linn.

Achyranthes aspera, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 63.

Ill.—Rheede, Hort. Mal. x. t. 78; Rumpf, Amb. vi. t. 12, f. 1; Wight, Ic. Pl. Ind. or. v. t. 1777; Engl. Bot. Jahrb. xxx. 1901–02, t. 1, ff. G–J; Engl. & Prantl, Pflan. iii. part 1A, f. 47, D, E; Marloth, Fl. S. Afr. i. t. 45, f. F.

Vernac. names.—Hakorin machiji (Hausa, *Dalziel*); Aboro (Yoruba, *Millson*); Erg-el-asda (Arabic, *Muriel*); Karalsebo (Ceylon, *Waring, Moloney*).—The Prickly Chaff-flower.

Upper and Lower Guinea, and widely distributed in the tropical parts of the Old World; and in South Australia, New South Wales, Queensland, &c.

The ashes of the plant are used as an alkali in dyeing and astringent and diuretic properties are attributed to the whole plant in India (Watt, Dict. Econ. Prod. India). The fresh root is ground and used as a remedy for scorpion stings, India (Bonavia, Mus. Kew); portions of the branches are used as toothbrushes in the Hadramaut, Arabia (Lunt, Mus. Kew) and specimens have been sent from Malacca, sold in Aden for the same purpose and said to come from Somaliland (Derry, Mus. Kew).

A much branched weed 4–5 ft. high, Blue Nile (Muriel, Herb. Kew), an erect, hairy herb, 1–4 ft. high (Fl. Trop. Afr. l.c.); 3–4 ft. high, up to 3,000 ft. altitude, all over India, a troublesome weed in gardens (Watt, l.c.).

ALTERNANTHERA, Forsk.

Alternanthera achyranthoides, *Forsk.*; Fl. Trop. Afr. VI. Sect. 1, p. 73.

Ill.—Pal. de Beauv. Fl. Oware, Benin, ii. t. 99, f. 1 (*A. ficoides*); Engl. & Prantl, Pflan. iii. part 1A, f. 48 H (*A. sessilis*).

Vernac. names.—Mai-Kaindubu (Hausa, *Dalziel*); Sawewe (Lagos, *Thompson, Dawodu*).

Widely distributed in Tropical Africa, and also in South Asia and Australia.

Whole plant included in "Agbo," Lagos [*see* p. 50] (Dawodu, No. 20, Herb. Kew).

1–3 ft., rooting at the lower nodes, Aburi (Brown, Herb, Kew); sometimes rootstock woody (Fl. Trop. Afr. l.c.); common on sandbanks, Kworra (Barter, Herb. Kew).

GOMPHRENA, Linn.

Gomphrena globosa, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 75.

Ill.—Rheede, Hort. Mal. x. t. 37; Commelin, Hort. Med. Amstel. Pl. i. t. 45 (*Amarantho affinis* &c); Rumpf, Amb. v. t. 100, f. 2; Gaertner, Fruct. Sem. Pl. ii. t. 128; Desc. Ant. v. t. 320; Bot. Mag. t. 2815; Wight, Ic. Pl. Ind. Or. v. t. 1784; Transv. Agric. Journ. v. July 1907, t. 189; Engl. & Prantl, Pflan. iii. part 1A, f. 46. c.

Vernac. names.—Bachelors' Buttons (Jamaica, *Fawcett & Rendle*).—Annual Globe Amaranth.

Oloke Meji (Dodd, No. 456, Herb. Kew); Old Calabar and Cross River (Holland Nos. 121 & 251 Herb. Kew), Brass River (Barter, No. 116, Herb. Kew) in Nigeria; Uganda and other parts of the Old World. A native of South America.

An annual, 3 ft. high. Extensively cultivated as an ornamental plant (Bot. Mag. l.c.). Cultivated in garden at Oloke Meji (Dodd, l.c.). Introduced to Dahomey, grown in gardens of Europeans, regarded as fetish by the natives (Chevalier, Bull. Soc. Nat. d'Accl. de France, 1912, p. 242).

CHENOPODIACEAE.

CHENOPODIUM, Linn.

Chenopodium ambrosioides, *Linn.*; Fl. Trop. Afr. VI. Sect. I, p. 79.

Ill.—Plenck, Ic. t. 168; Desc. Ant. i. t. 58; Nees von Esenbeck, Plant. Medic. Düsseld. t. 122; Wagner, Pharm. Med. Bot. t. 130; Guimpel, Abbild. Beschr. t. 269; Hayne, Darst. Beschr. Gewächse, xiii. t. 15; Wight, Ic. Pl. Ind. Or. v. t. 1786; Berg & Schmidt, Darst. & Beschr. Pharm. i. t. 2C; Bettfreund, Fl. Argent. iii. t. 147; Engl. & Prantl, Pflan. iii. part 1A, f. 25 K–Q; Henkel, U.S.Dept. Agric. Farmer's Bull. No. 188, 1904, p. 41.

Vernac. names.—Ma-nturisi (Oloke Meji, *Dodd*); Paico (Argentine, *Bettfreund;* Chile, Mus. Kew); Ambrosie, ou thé du Mexique (Antilles, *Descourtilez*); Herva formigueira, Herva de

Santa Maria (Angola-Portuguese Colonists, *Welwitsch*); Iparote (Mexico, *Palmer*); Herba Santa Maria (Brazil, *Hooper*); Culen (Chile, *Hooper*).—Sweet Pigweed, Mexican Tea, Jerusalem Oak, American Wormseed.

Oloke Meji (Dodd, No. 412, 1908, Herb. Kew); Lower Congo, Angola, Mozambique District and widely distributed in many warm countries; naturalised in Florida, California and other United States.

Used medicinally, Oloke Meji (Dodd, Herb. Kew), Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 898), by the Indians, Mexico, as a febrifuge (Palmer, Proc. Amer. Acad. Arts & Sci. xxi. 1886, p. 437), in the Antilles (Descourtilez. l.c.) and in India—as an infusion or tea of the plant (Hooper, Agric. Ledger, No. 6, 1904, p. 68).

An infusion is used in the treatment of indigestion, Chile (Mus. Kew) and in the Museum there is exhibited a specimen of "Serkys" Tea, described as a mixture of herbs from Lebanon and Mecca including *C. ambrosioides*, as sold in Paris.

Wormseed used as an anthelmintic, United States, is cultivated to a considerable extent in Maryland, where the distillation of the plant for the oil is carried on chiefly from the fruit: but sometimes from the leafy part of the plant (Henkel, *seq.* p. 42).

The plant is under experiment in India as a source of oil from the seed (Perfumery & Essential Oil Record, *seq.*).

A sub-erect annual 2 ft. high; but according to Welwitsch (Hiern, l.c.) commonly biennial or triennial; and in general a common weed. Propagated from seed, and under cultivation may be planted out about 1½ ft. apart.

Ref.—"American Wormseed—*Chenopodium ambrosioides*," in "Weeds Used in Medicine," Henkel, U.S. Dept. Agric. Farmers' Bull. No. 188, 1904, pp. 41–42.——"Indian Wormseed Oil," in The Perfumery and Essential Oil Record, March 1919, pp. 53–54. ——"Thymol *versus* Chenopodium Oil," l.c. May 1919, pp. 139–140.——"Chenopodium in India," l.c. Sept. 1919, pp. 231–232.——"Thymol *versus* Chenopodium for Hookworm Disease," in The Agric. News, Barbados, xviii. July 26, 1919, pp. 238–239.——"The Treatment of Ankylostomiasis by Oil of Chenopodium," l.c. March 8th, 1919, p. 71.

BASELLA, Linn.

Basella alba, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 94.

Ill.—Rumpf, Amb. v. t. 154; Wight, Ic. Pl. Ind. Or. iii. t. 896; Engl. & Prantl, Pflan. iii. part 1A, f. 73 A–F.

Vernac. names.—Bolongi (Sierra Leone, *Scott Elliot*).—Indian Spinach, Malabar Nightshade.

Cameroons at 1000 ft. (Mann, No. 1250, Herb. Kew); Sierra Leone, Abyssinia, East Africa and other parts of Tropical Africa, also in India and East and West Indies.

Commonly cultivated as spinach; in Dominica (Rep. Agric. Dept. Dominica, 1917–18, p. 5; Agric. News Barbados, Oct. 6th, 1906, p. 317) and other parts of the West Indies, the young shoots being cooked like European spinach (*spinacea oleracea*, Linn.) (l.c. Nov. 3rd, 1917, p. 349); India (Hooper, Agric. Ledger, No. 6, 1904, p. 65), Sierra Leone (Scott Elliot, Herb. Kew). A climbing plant suitable for trellis work, or covering the ground.

Beta, Linn.

Beta vulgaris, *Linn.* Sp. Pl. (1753) p. 222.

A biennial, usually grown as an annual. Root fleshy, conical or napiform; blood red; leaves large, succulent, more or less the colour of the root; but varying according to variety, of which there are many under cultivation.

Beetroot; Sugar Beet; Mangold or Mangel, Mangold Wurzel.

A native of Southern Europe—Mediterranean region. Cultivated more or less throughout Europe, Canada, United States and many warm countries.

The "Red Beet" is well known in gardens everywhere as a vegetable; the "Silver Beet" (*B. vulgaris*, var. *Cicla*) is grown for the leaf used as a vegetable, more especially in France, and the "Mangold" or "Mangel" which comes under the same species is an important field crop at home and in America. The "Sugar Beet" includes the white varieties "blanche à sucre améliorée" and blanche à sucre Klein-Wanzleben," capable of producing 16 to 18 per cent. of sugar of which our chief supplies come from France, Belgium, Denmark, Holland and Central Europe. Syrup is also made from this root and in France Beetroot is the most important source of industrial alcohol—distilled largely from refuse, molasses, or from beets containing so low a percentage of sugar (4 per cent. or so) as to be unprofitable for use in the sugar factories; though at times it may happen that the high price of alcohol enables distillers to use the best roots. In the preparation for sugar the leaves and crowns may be fed to stock, used in the fresh stage, dried or as ensilage and the pulp residue is also good fodder. An average of 4 tons of tops (1 ton crowns, 3 tons leaves) is a good yield per acre which when dried give about 1 ton of feeding material considered equal in value to the same quantity of first-class hay (Townsend, Year Book, U.S. Dept. Agric. 1908).

"Salino-Sodico" is a residual product of the Spanish Beet Sugar Industry, a first shipment of 250 tons from Bilbao was made to Hamburg in 1914 (Bd. of Trade Journ. May 7th, 1914, p. 356).

In Africa *Beta vulgaris* has been grown in Nigeria—Ibadan as a vegetable (Ricketts, Govt. Gaz. S. Nigeria, March 3rd, 1909, Suppl. p. 11), Zaria, for decorative purposes (Parsons, N. Nig. Gaz. April 30th, 1910, p. 99)—in Egypt—Upper Division of the country; "the sugar content is high; the crop occupies the

land about 6 months and is practically always manured with nitrate of soda which greatly increases the yield" (Foaden, "Note on Egyptian Agriculture," in U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 12, 1904, p. 46), Dahomey, as a vegetable and forage plant (L'Agric. prat. pays chauds, ii. 1902–03, p. 29), and British East Africa—Govt. Exp. Farm, Kabete, Nairobi, where experiments have been made with the varieties "Mammoth Long Red Mangold"—planted April 23rd, harvested Nov. 4th, approx. yield 64 tons per acre; "Golden Tankard Mangold" and "Yellow Globe Mangold"—planted Nov. 19th (1912), harvested May 30th (1913), approx. yield 38½ and 46 tons respectively; "Sugar Beet," planted and harvested same dates as the two foregoing, approximate yield 23¼ tons per acre. The report of the Government Analyst on sample roots: Weight of topped root 5 lb. 7½ oz.; Sugar in root 13·9 per cent., Sugar in juice 15·27 per cent., Juice purity 77 per cent. Another root weighing 5 lb. 12¾ oz., gave for sugar in root and juice and juice purity approximately 1, 2 and 3 per cent. lower than the above. It is important in experiments of this nature to know what to aim at and the further report is accordingly quoted in full:—"Considering the great size of these roots the sugar content is very satisfactory indeed. Small roots are usually richer than large ones—manufacturers prefer roots of 1½ lb. to 2 lb. weight and this size is obtained by growing the plants closer together in the lines and by having the drills as narrow as is compatible with cleaning operations. In this way a heavier crop is obtained and as the sugar content would almost certainly go up to 16 per cent. a much greater weight of sugar per acre is grown. The juice purity is another important factor which can be influenced by cultivation. If the plants are encouraged to make too much growth the juice purity—the proportion of sugar in the total solids of the juice—is lowered. This affects the value of the beet to the manufacturer as it increases the work of purification. A juice purity of 80 per cent. is usually looked for." (Ann. Rep. Dept. Agric. B. E. Africa, 1912–13, p. 112).

As a further indication of the probable success with Sugar-Beet in the Tropics, experiments in Hawaii—an important source of cane sugar—have shown that the beets raised (in Lanai Island) are very rich in sugar, and that with the aid of artificial irrigation it was hoped that 60,000 tons of sugar would be produced on this island, for many years uncultivated because of drought (Bull. Bur. Agric. Intellig. Rome, Nov. 1910, p. 71), and in Mexico the region of Tampico is reported to be admirably suited to raising sugar beets, the yield of which is much higher than that in the United States (l.c. July 1911, p. 1650).

As a vegetable the following varieties are recommended in Cuba—"Crimson Globe" attains market size in about 90 days from sowing; "Edmund's Blood Turnip" and "Extra Early Eclipse" attain marketable size in about 90 days and yield at

the rate of about 20,000 marketable beets per acre; "Detroit Early Red Turnip," quality fair and marketable in from 90 to 100 days from the time of sowing and also "Early Blood Turnip," "Bastian," "Extra Early Electric," "Columbia," "Extra Early Egyptian" and "Bassano" (Austen & Halstead, Estacion Cent. Agronomica de Cuba, Bull. No. 13, June 1908, "Vegetable growing in Cuba," pp. 23–24).

Raised from seed, sown in rows 9–10 in. apart and thinned out to 4 or 6 in. apart. in the rows, perferably in a light rich loamy soil.

Ref.—"The Cultivation of Sugar Beet," in Journ. Roy. Agric. Soc. Series 3, i. 1890, pp. 441–449.——"Sugar Beet Cultivation in Austria," Clarke, in l.c. ii. 1891, pp. 325–354; with illustrations of the various sugar-beets grown.——"Essais de Culture de la Betterave à Sucre," Mauritius, Boname, in Rep. St. Agron. 1894, pp. 47–50.——"The Improvement of the Sugar-Beet and Sugar-Cane," in Kew Bull. 1897, pp. 317–318. ——"The Growth of Sugar-Beet and the Manufacture of Sugar in the United Kingdom," Lawes & Gilbert, in Journ. Roy. Agric. Soc. ix. 1898, pp. 344–370.——The Sugar Beet, Wiley, U.S. Dept. Agric. Farmers' Bull. No. 52, 1899, pp. 1–47.——Comparative Tests of Sugar-Beet Varieties, Tracy & Reed, U.S. Dept. Agric. Bureau of Plant Industry, Circ. No. 37, 1900, pp. 1–21.——"On the Cost of Eighty-eight per cent. Beet-Sugar," in The Inter. Sugar Journ. ii. 1900, pp. 172–176; cost per acre, &c.—— Cultivation of Sugar-Beet in North India, Subbiah, Dept. of Land Records and Agriculture, N.W. Prov. & Oudh, Bull. No. 13, 1901, pp. 1–12.——"Manufacture of Alcohol from Sugar Beetroots," Stein, in Inter. Sugar Journ. iv. 1902, pp. 545–547; vi. 1904, pp. 349–356; pp. 400–401; with balance sheet of an Alcohol Distillery working 1000 gallons of (96 per cent.) Alcohol per day, for a campaign of 120 days.——De l'industrie du Sucre et en particulier de Sucre de Betteraves aux Etats-Unis, Vilmorin, pp. 1–16 (Compiègne, 1905).——"The Cultivation of Sugar Beet," Sawer, in Natal Agric. Journ. x. 1907, pp. 883–887; with 4 plates showing types of desirable and undesirable roots.——"Sugar Beet, *Beta vulgaris*," Townsend, in Cycl. Amer. Agric. Bailey, ii. pp. 588–599, illustr. (Macmillan & Co. Ltd., London, 1907). ——"By-products of the Sugar Beet and their Uses," Townsend, in Year Book, United States Dept. Agric. 1908, pp. 443–452. ———Irrigation of Sugar Beets, Roeding, U.S. Dept. Agric. Farmers' Bull. No. 392, 1910, pp. 1–52, illustrated.——Sugar Beet: Some Facts and Some Illusions, "Home Counties" (J. W. Robertson-Scott), pp. 1–424, illustrated ("Field Office," London, 1911).——"Cultivation of Sugar Beet," in Journ. Bd. Agric. xix. May 1912, pp. 134–135.——"Sugar Beets as Food for Live Stock," l.c. Nov. 1912, pp. 664–668.——Cultivation of Mangolds, Bd. of Agric. (London) Leaflet No. 169, 1912. ——"Sugar Beet Pulp for Feeding Live Stock," l.c. xx. Dec. 1913, pp. 784–793.——Sugar Beet Growing under Humid Condi-

tions, Townsend, U.S. Dept. Agric.; Farmers' Bull. No. 568, 1914, pp. 1–20.——Sugar Beet Growing under Irrigation, Townsend, *idem*, No. 567, 1914, pp. 1–26.——Evaporation in the Cane and Beet Sugar Factory: A Theoretical and Practical Treatise, Koppeschaar, pp. 1–116 (Norman Rodger, London, 1914).——"Feeding and Manurial Value of Sugar Beet Crowns and Leaves," in Journ. Bd. Agric. xxii. 1915, pp. 750–760.——"The Growing of Sugar Beet," l.c. March 1916, pp. 1210–1214; including Cost of Cultivation, By-products, and General.——Sugar Beet Sirup, Townsend & Gore, U.S. Dept. Agric. Farmers' Bull. No. 823, 1917, pp. 1–13.——"The United States Beet Sugar Industry; A Federal Trade Commission Report," Inter. Sugar Journ. xix. 1917, pp. 410–413, cost of growing, &c.——Sugar Beet Seed: History and Development, Palmer, pp. 1–120 (Chapman & Hall, Ltd. London, 1918).——Beet Top Silage and Other By-Products of Sugar Beet, Jones, U.S. Dept. Agric. Farmers' Bull. No. 1095, 1919, pp. 1–24.

PHYTOLACCACEAE.

Phytolacca, Linn.

Phytolacca dodecandra, *L'Herit.*; Fl. Trop. Afr. VI. Sect. 1, p. 97.

Ill.—Comm. Soc. Reg. Gottingensis, xii. t. 2 (*P. abyssinica*); L'Hérit. Stirp. Nov. t. 69; Wood, Natal Pl. iii. t. 263 (*P. abyssinica*).

Vernac. names.—Endottaral (Abyssinia, *Roth*); Vahivoraka (Madagascar, *Heckel*); Luoko (Uganda, *Wilson*); Mohaden (Natal, *Wood*); Muhoko (Kikuya, E. Africa, *Battiscombe*); Mutonga-tonga (Golungo Alto and Pungo Andongo, *Welwitsch*).—Mustard Tree of Scripture.

Lagos: Cameroons, Gold Coast, Sierra Leone and widely distributed in Tropical Africa; Natal; &c.

The seeds—a cold infusion of them—are used as soap for washing cloths, Abyssinia (Roth, Herb. Kew); the fruit is used by the Waganda (in Uganda) to wash themselves with (Wilson, Herb. Kew); the leaves when boiled or pounded are used instead of soap for washing clothes by the natives in Angola, where the bark and leaves are said to be used for various medicinal purposes (Hiern, Cat. Welw. Afr. Pl. iv. p. 901); young shoots used in sauces and the leaves as a substitute for spinach (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 312). Considered poisonous by the natives in Natal (Wood. l.c.). Heckel states that death has occurred following the administration of 10 to 15 grammes of the juice of raw fresh leaves and further attributes various medicinal uses to the roots and leaves in Madagascar (Ann. l'Inst. Col. Marseille, i. 1903, fasc. 2, p. 168).

A woody climber with slender stems sometimes 15–20 ft. long (Fl. Trop. Afr. l.c.); a shrub, but little wood, climbing

to the height of 10–30 ft., Pungo Andongo, or an undershrub climbing high, with white-yellowish flowers and scarlet fruits, Golungo Alto (Hiern, l.c.); a shrub in the Kikuya country at an altitude of 7000–8000 ft. (Battiscombe, Herb. Kew).

Phytolacca dioica, Linn., the "Bella Sombra" of the Portuguese cultivated in Spain (Mus. Kew) and in Lisbon as a shade tree, was recommended by Welwitsch for planting in public squares, &c., in Angola (Hiern, l.c. p. 902). It is a quick grower and might be propagated by seeds or cuttings and would be preferable to the above species for ornamental and shade purposes.

POLYGONACEAE.

Polygonum, Linn.

Polygonum senegalense, *Meisn.*, Fl. Trop. Afr. VI. Sect. 1, p. 111.

Lagos, Ogun River, Katagum, in Nigeria; Gold Coast, Senegal and widely distributed in Tropical Africa; also in Egypt, Madagascar and Tropical Asia.

Reputed to possess medicinal properties, Gold Coast (Johnson, Herb. Kew).

A perennial plant 4–5 ft. high; growing in water Ogun River (Millen, Herb. Kew), in swamps, Aburi (Johnson l.c.) and described by Welwitsch (Hiern, Cat. Welw. Afr. Pl. iv. p. 904) as a handsome plant, stem as thick as a man's finger, sometimes thicker, fistulose, brilliantly red, 4–10 ft. high, decumbent or floating at the margins of rivers, or in ponds.

Polygonum Fagopyrum, *Linn.* Sp. Pl. p. 364. (*Fagopyrum esculentum*, Moench).

An annual plant about 2–3 ft. high. Leaves triangular-cordate; about 1–4 in. across, the upper amplexicaul the lower with petioles. Inflorescence a compound cyme; flowers small, pink or white. Seed or nut, triquetrous with angles sharply defined, dark-brown.

Ill.—Gleichen, Entdeckungen, tt. 60, 61; Plenck, Ic. t. 310; Dreves & Hayne, Choix Pl. Europe, iv. t. 77; Hayne, Darst. Beschr. Gewächse, v. t. 24; Sturm. Flora, Incompletae; Metzger, Europ. Cerealien, t. 20, f. B; Zenker, Fl. Thuringen, ix. t. 964; Spach, Suites (Hist. Nat. des Végétaux) t. 72; Syme, Eng. Bot. ed. 3, t. 1226 (*Fagopyrum esculentum*); Church, Food Grains, India, p. 115 (*F. esculentum*); Duthie, Field Crops (*F. esculentum*); Cycl. American Agric. ii. p. 218, f. 311 (*F. esculentum*); Fyson, Fl. Nilgiris & Pulney Hill-Tops, p. 226 (*F. esculentum*).

Buckwheat; Brank; Blé Sarrasin.

A native of Central Asia, wild in China and Siberia, commonly cultivated in Western Tibet at 2000–12,000 ft.; in India —the Khasia Mts., the Himalaya Mts., and the Nilgiri Hills

(Fl. Br. India, v. p. 55); in Central and Southern Europe and in Japan.

At Maigana, N. Nigeria, Japanese Buckwheat is reported a failure as "it does not appear to stand the very hot climate" (Rae, Rep. Agric. Dept. N. Provinces, 1914, p. 12). It should, however, be tried on the higher altitudes; it is grown to a small extent in the neighbourhood of Nairobi and in the districts farther towards Lake Victoria (Bull Imp. Inst. 1906, p. 274); in Uganda it has been found to yield about 500 lb. of seed per acre (Ann. Rep. Dept. Agric. Uganda, 1914, p. 13)—not a big crop perhaps; but sufficient to show that the plant can be grown to maturity in Tropical Africa—and the plant seems to have been grown with some success in Dominica for bee-feeding —"6 in. high 19 days after sowing, developing into fairly strong dwarf plants and giving a profusion of flowers for four weeks" (Ann. Rep. Bot. St. Dominica, 1907–08, p. 34).

Grain commonly grown for human food, for feeding poultry, game, horses and cattle; for which the plant can also be used as green fodder and the flowers are a good food for bees.

Propagated by seed, of which from one to three bushels are required to sow an acre. The plant will not stand frost; but requires a warm climate and will grow in comparatively poor soil; germination takes place in from 5–6 days after sowing, maturing in 3–4 months; but also stated to mature in a shorter period than any other grain-crop, 8 or 10 weeks being sufficient under favourable conditions (Cycl. Amer. Agric. ii. p. 219). The yield may be from 3–6 quarters (qr. 392 lb.) per acre.

Ref.—"*Fagopyrum esculentum*," in Dict. Econ. Prod. India, Watt, iii. (1890) pp. 310–311.——"Common Buckwheat," in Kew Bull. 1893, p. 3.——"Buckwheat," in Cycl. American Agric. Bailey ii. (1907) pp. 217–221.——"*Fagopyrum*," in Comm. Prod. India, Watt, pp. 532–533 (John Murray, London, 1908).——"Buckwheat," in The Small Grains, Carleton, Chapter xxii. pp. 581–599 (The Macmillan Co. New York, 1916). ——"The Cultivation of Buckwheat," in Journ. Bd. Agric. Feb. 1916, pp. 1128–1134; April 1918, pp. 81–84, and Food Production Leaflet, No. 42, 1918.

ARISTOLOCHIACEAE.

Aristolochia, Linn.

Aristolochia albida, *Duch.*; Fl. Trop. Afr. VI. Sect. 1, p. 137.

Vernac. name.—Gadakuka or Gadau-Kuka (Hausa, Katagum, *Dalziel*).

Root, bitter, a remedy for Guinea Worm and a bitter tonic; sometimes sold for that of "Jibda Kassa" (*Cissampelos Pareira* —see p. 52) (Dalziel, Hausa, Bot. Voc. p. 31).

A shrubby climber, perianth dusky purple (Welwitsch) or flowers black, Nupe (Barter, Herb. Kew).

Aristolochia bracteata, *Retz.*; Fl. Trop. Afr. VI. Sect. 1, p. 136.

Vernac. names.—Gerbaad (Abyssinia *Roth*); Erig Agrab (Arabic), Tedgir (Denga) (Sudan, *Broun*).

Bornu, in N. Nigeria and in Eastern Chari, Uganda, Sudan, &c.

Root used (by friction) by natives against scorpion bites, Sudan (Broun, Herb. Kew).

Aristolochia elegans, *Mast.*; Fl. Trop. Afr. VI. Sect. 1, p. 138.

Ill.—Gard. Chron. Sept. 5th, 1885, p. 301, f. 64; Bot. Mag. t. 6909; Garten-Zeitung (Berlin) 1886, p. 464, f. 101; Rev. Hort. Belge, 1889, p. 36; Wien. Ill. Gartzeit, 1890, p. 194, f. 40; Gard. Chron. Oct. 31st, 1891, p. 514 (seed vessel); Aug. 21st, 1897, p. 123; Rev. Hort. 1898, p. 408.

Brass, Old Calabar, and found in Brazil.

A glabrous climber; flowers cream-coloured with dark spots (Kirk, Herb. Kew).

Aristolochia Goldieana, *Hook. f.*; Fl. Trop. Afr. VI. Sect. 1, p. 142.

Ill.—Trans. Linn. Soc. xxv. (1866) t. 14; Bot. Mag. t. 5672; Fl. des Serres, xvii. (1867–68) t. 1729–1730; Gard. Chron. Nov. 9th, 1867, p. 1143; April 26th, 1890, p. 521, f. 83; May 22nd, 1897, p. 337, f. 116; Sept. 8th, 1906, p. 176, f. 72.

Lokoja, Old Calabar.

A climber 20 ft. or so long, with remarkable flowers—greenish with red purple ribs outside, brownish and yellow-mottled inside. This plant has flowered on several occasions since its introduction to Kew about 1867, when it has been of considerable interest to the visitors.

All of the above are more or less ornamental; otherwise they are of no special value; but it may be of interest to note that the use given for the root of *A. bracteata* in Sudan is also said to be of value for the same purpose in India (Treas. Bot.) and the "Virginian Snake Root" (*A. serpentaria*, Linn.) of the United States, used as a stimulant tonic had at one time a similar reputation (Mus. Guide).

PIPERACEAE.

Piper, Linn.

Piper Betle, *Linn.* Sp. Pl. (1753) p. 28.

A perennial creeper, leaves coriaceous, alternate, broadly ovate, base cordate, somewhat lop-sided, 3–5 in. long, 2–3 in. across; 6 prominent nerves diverging from the mid-rib near the base; glabrous and dark-green above, paler and slightly hairy below; petioles 1–1½ in. long. Flowering spikes—male 3–6 in.

long, female long peduncled 1–5 in. pendulous (Hooker). Fruit about ¼ in. diam. fleshy.

Ill.—Rheede Hort. Mal. vii. t. 15; Wight Ic. Pl. Ind. Or. t. 2926 (*Chavica Betle*); Bot. Mag. t. 3132.

Betle Pepper.

Cultivated in Botanic Gardens, Old Calabar; in India, Ceylon, Zanzibar, &c., probably native of Java.

Grown in India on a large scale for the leaf, used for chewing (with lime and Areca nut) and for various medicinal purposes. "Betel Oil" may be distilled from the leaves (yield ·5 to 1 per cent.); but it is of no commercial importance (Parry, Chem. Ess. Oils, p. 205).

Grown in Zanzibar in places artificially watered and shaded, for its leaf which is sold in every village (Kew Bull. 1892, p. 90).

In India the cultivation is said to require some skill and varies in different localities.—In Madras cuttings from two-year-old plants are put in near specially-raised plants of *Sesbania grandiflora*, and leaves are picked after the first year's growth (Watt, *seq. q.v.* for full particulars of cultivation). In Mysore the betel-vine is grown on supports of *Eriodendron* (*see* p. 89) in Areca plantations.

Ref.—"*Piper Betle*" in Dict. Econ. Prod. India, Watt, vi. part 1A, 1892, pp. 247–256.——"*Piper Betle*" in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 183–192. ——"*Piper Betle*," in Commercial Products of India, Watt, pp. 891–896 (John Murray, London, 1908).——"Betel Leaf at Chik-Kodi, Belgaum District," Hiremath, in Agric. Journ. India, iv. 1909, pp. 365–374—— "Studies in the Chemistry and Physiology of the Leaves of the Betel-Vine (*Piper Betle*) and of the Commercial Bleaching of Betel-Vine Leaves, Mann, Sahasrabuddhe & Patwardhan, Memoirs, Dept. Agric. India (Chem. Series) iii. No. 2, 1913, pp. 17–63.

Piper Cubeba, *Linn. f.*, Suppl. Pl. (1781) p. 90.

A climbing shrub. Leaves alternate, broadly lanceolate, acuminate lop-sided, 6 prominent nerves diverging from the mid-rib near the base, glabrous on both sides, dark-green above, pale-green below, 4–5 in. long, about 2 in. across the centre; petiole about ½ in. long. Inflorescence dioecious; male spikes about 1¼ in. long; female spikes about 2 in., bearing numerous fruits. Fruit globular, ¼ in. in diam., shortly stalked and bluntly apiculate, smooth when fresh, rougher when dry.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 92; Nees von Esenbeck, Plant. Medic. Düsseld. t. 22; Desc. Ant. vi. t. 429; Woodville, Med. Bot. v. (1832) t. 27; Stephenson & Churchill, Med. Bot. t. 175; Guimpel, Abbild. Beschr. t. 230; Hayne, Darst. Beschr. Gewächse, xiv. t. 8 (*Cubeba officinalis*); Berg & Schmidt, Darst. & Beschr. Pharm. iv. t. 29A (*Cubeba officinalis*); Baillon, Hist. Pl. iii. p. 471, f. 508 (*Cubeba officinalis*); Baillon, Hist. Pl. iii. p. 471, f. 508 (*Cubeba officinalis*); Bentl. & Trimen, Med. Pl.

t. 243, ff. 2–11; Kew Bull. Dec. 1887, p. 3; Greshoff, Nutt. Ind. Pl. t. 37, ff. 1–4; Köhler, Med. Pflan. (*Cubeba officinalis*); Planchon & Collin, Les Drog. Simples, i. ff. 328–330; Greenish, Materia Medica, p. 154, ff. 81, 82.

Vernac. names.—Cubeba (Spanish, *Descourtilez*); Cumac (Java, *Woodville*).—Cubebs or Java Pepper.

Lagos, Old Calabar—in the Botanic Gardens; native of Java and the Moluccas.

"Cubebs" of Commerce are the fruits, which closely resemble those of ordinary Pepper (*P. nigrum*); they are used medicinally and both the fruits and an oil extracted from them to the extent of 10 to 18 per cent. (Parry, Chem. Ess. Oils, p. 202) "Cubeb Oil" are official in the British Pharmacopœia. Supplies of the fruit come chiefly from Java, but the demand would appear to be limited. India also imports fruits and to a small extent produces some by cultivation (Dict. Econ. Prod. India). The cultivation is easy and plants may be conveniently grown at the foot of shade trees in Coffee Plantations, &c.

Ref.—"Cubebae," in Pharmacographia, Flückiger & Hanbury, pp. 584–589.——"Cubebs (*Piper Cubeba*, L.)" in Kew Bull. Dec. 1887, pp. 1–4.——"*Piper Cubeba*" in Med. Pl. Bentley & Trimen, No. 243, 4 pages——"*Piper Cubeba*," in Dict. Econ. Prod. India, Watt, vi. part 1A, 1892, pp. 257–258.——"*Piper Cubeba*," in Nuttige Indische Planten, Greshoff, pp. 157–159.——"Poivre Cubèbe," in Les Drogues Simples d'Origine Végétale, Planchon & Collin, i. pp. 415–425, including particulars of "Faux Cubèbes" (Paris, 1895).

Piper guineense, *Schum.* & *Thonn.* [*P. Clusii*, C.DC.]; Fl. Trop. Afr. VI. Sect. 1, p. 145.

Ill.—De Wildeman, Mission E. Laurent, i. p. clxxv. (fruits); Thonner, Blütenpfl. Afr. t. 27; Engl. & Drude, Veg. Erde, ix. p. 649, f. 560; De Wildeman, Etudes Fl. Bangala, p. 129, f. 51.

Vernac. names.—Masoro (Hausa, *Dalziel*); Komasimi (Sierra Leone, *Scott Elliot*); Yaray (Sierra Leone, Col. & Ind. Exhib. 1886); [Sassama (Cape Coast) Assawansah (Axim) *African Plantations Ltd.*); Iyere (Lagos, *Dawodu*); Senna (Winnebah, *Christy*); Dojvie, Saosa (Gold Coast, *Crowther*); Ehien (Benin, *Unwin*); Jihefo or Jihefu (Golungo Alto, *Welwitsch*); Pimenta (Island of St. Thomas, *Welwitsch*).—Black Pepper of West Africa; Ashantee Pepper; African Cubebs (Wharton, Mus. Kew); Benin Pepper.

Lagos, Benin, Bornu, in Nigeria, and also found on the Gold Coast, Sierra Leone, French Guinea in West Africa, and in Uganda, Angola, &c.

The fruits of this species was known as early as 1364 from the Grain Coast (Liberia) and 1485 from Benin, exported from the latter place by the Portuguese in a vain attempt to sell it in Flanders, and one cask of it was offered for sale in London as "Cubebs," Feb. 11th, 1858 (Flückiger & Hanbury, Pharmaco-

graphia, p. 589); but it does not appear to be a suitable substitute for true "Black Pepper."

Locally the fruits or small dried berries sold for spice and medicinal use, Nigeria (Dalziel, Hausa, Bot. Voc. p. 76); used by the country people to eat with rice and as a purge (drink) in Sierra Leone (Scott Elliot, Herb. Kew) in thickening soup, Lagos (Dawodu, Herb. Kew), as a native medicine for sores, Aquapim, Gold Coast (Murray Ramsay, Herb. Kew) and for "intense pains of the stomach," Gold Coast (specimen from African Plantations Ltd. in Herb. Kew). "Ashanti Pepper oil" is described as "colourless to palish-yellow, peppery and at the same time sweetish odour" (Schimmel, Semi-Ann. Rep. April 1914, p. 101).

A climbing shrub reaching a height of from 30–40 ft., with bright-red fruits. Yields the "bush pepper" of the Sierra Leone Markets (Barter, Herb. Kew); sold locally in the markets, Benin (Unwin, MSS. Report, 1907); brought by native merchants from the interior for sale in the Gold Coast markets (Pharm. Journ. [1] xiv. 1854, p. 199; Moloney, For. W. Africa, p. 410).

Ref.—"On the *Cubeba Clusii* of Miguel, the Black Pepper of Western Africa," Daniell in Pharm. Journ. xiv. (1854), pp. 198–203.

Piper nigrum, *Linn.* Sp. Pl. (1753), p. 28.

A climbing perennial shrub, including several varieties. Leaves alternate, coriaceous, ovate-acuminate, prominently nerved, 3 pairs diverging from the midrib near the base, glabrous on both sides, dark-green above, pale-green below; 5 in. long, 3 in. broad (in specimen of Kew plant examined; but Ridley states (Spices, p. 241, that the leaves vary considerably—4–10½ in. long, 2½–5 in. wide); petiole 2½ in. (½ in. or less—Ridley l.c.). Flowering spikes usually longer than in the foregoing species. Fruit a berry less than ¼ in. in diam.; and excepting the stalk-like base resembling *P. cubeba*; reddish to yellow when freshly ripe; black when dry—the peppercorn of commerce.

Ill.—Rheede, Hort. Mal. vii. t. 12 (*Molago-Codi*); Plukenet, Almag. t. 437, f. 1 (*P. rotundum nigrum*); Blackwell, Herb. ii. t. 348; Plenck, Ic. t. 25; Marsden, Sumatra, t. 1 (habit); Dict. Sc. Nat. t. 291; Nees von Esenbeck, Plant. Medic. Düsseld. t. 21; Woodville, Med. Bot. iv. (1832) t. 246; Bot. Mag. t. 3139; Blanco, Fl. Filip. t. 11; Stephenson & Churchill, Med. Bot. t. 174; Guimpel, Abbild. Beschr. t. 229; Hayne, Darst. Beschr. Gewächse, xiv. t. 6; Burnett, Pl. Util. i. t. 13b; Spach, Suites (Hist. Nat. des Végétaux) t. 125; Miquel in Nov. Act. Acad. Nat. Cur. xxi. Suppl. (1846) t. 50; Wight, Ic. Pl. Ind. Or. vi. t. 1934, tt. 1935–6 (*P. trioicum*); Baillon, Hist. Pl. iii. p. 469, ff. 503–506 (fl. & fr.); Bentl. & Trimen, Med. Pl. t. 245; Köhler, Med. Pflan. ii.; Planchon & Collin, Les Drog. Simpl. i. f. 321; Journ. Roy. Hort. Soc. xxxv. (1910), p. 369, f. 129

(growing on Jak Tree), f. 130; Beccari, Wand. Gt. Forests, Borneo (Eng. Ed. 1904) p. 375, f. 59 (plantation); Agric. Journ. India, i. 1906, t. 4; Barber, Dept. Agric. Madras, Bull. No. 56, 1906, t. 1 (Pepper fl.), t. 2 (habit—"Balamcotta" of Wynaad), t. 3 (habit—"Kalavalli" of Wynaad); Macmillan, Trop. Gard. & Pl. p. 242 (fr. br.) p. 243 (habit); Ridley, Spices, pp. 240, 245 (in Borneo—plantation), p. 247 (Pepper from Borneo).

Pepper; Black Pepper; White Pepper.

Native of Assam and Malabar; cultivated in India, Ceylon, and other tropical countries; at Lagos, Old Calabar, &c. in the Botanic Gardens; also Gold Coast, Jamaica, and Trinidad; a plantation of 30,000 plants is reported in Sigi, German East Africa, in 1910 (Bull. Bur. Agric. Intellig. Rome, Nov. 1910 p. 116), but the countries producing the fruits in commercial quantities are chiefly Straits Settlements including Labuan (Borneo); Java, Sumatra, British India, and Siam. The use of pepper is well known as a condiment; "black pepper" is the dried unripe berries and "white pepper" the ripe fruit with the outer coating removed before grinding. Peas specially treated to resemble "black pepper" fruit have been sold as pepper under the name of "Erviop"—an anagram on the word "Poivre" (Pharm. Journ. [4] xix. 1904, p. 379).

Trade quotations (1919) are for "fair black Singapore," 9*d.*; "fair Tellicherry," 9¼*d.*; "Aleppy," 9*d.*; "white Singapore," 1*s.*, and "White Muntok," 1*s.* per lb. (Chem. & Druggist, March 22nd, 1919, p. 69).

The plant may be propagated by seed, layering, or cuttings—usually by the latter method; good strong tops with several joints are advisable and a few male plants should also be raised; a hot moist climate is essential together with rich soil.

Plants may be raised in nursery beds or the cuttings put out on raised mounds a foot or so high at the foot of supports—young saplings of *Eriodendron anfractuosum* (p. 87), Erythrina lithosperma (p. 215), *Mangifera indica* (p. 169), *Artocarpus integrifolia* (p. 644) or any quick-growing tree being recommended—specially set out in plantations about 6 or 7 ft. apart = 1,210 or 881 plants to the acre; the side branches of these support trees should be kept pruned and the tops regulated at a height of about 12 ft. to give a moderate amount of shade. Ordinary posts of strong durable wood 10–12 ft. high may also be used as supports. Plants might also be grown at the foot of shade trees used in other plantations of cocoa, &c.

Ridley in order to get good crops attaches importance to "turning down"—"When the pepper gets to the top of the post you must make it bend down to the bottom and start up again; three times must this be done before the pepper is expected to fruit heavily otherwise it is skinny and wretched" (Kew Bull. 1894, p. 79)—and burnt earth for manure, applied from time to time during the growth of the vine (Spices, p. 267; Derry, Kew Bull. 1893, p. 370). The yield is given at from

less than 1 lb. the first two years, about 1 lb. in the 3rd year increasing to about 10 lb. of pepper in the 5th year, continuing so for 15-20 years, in the Straits Settlements under Chinese Cultivation (l.c. p. 286). Preparation for market consists of careful drying on mats in the sun or by artificial means for "black pepper" and soaking the ripe-fruits in water until the skins are readily removed and afterwards drying in the same way for "white pepper."

This plant has been so often figured and discussed in the course of the last two or three hundred years that one hesitates to recommend the cultivation on a large scale in a new country; but where it is found to succeed well it may be of value and for full particulars of the cultivation, &c., the following works may be referred to.

Ref.—"Pepper" in The History of Sumatra, Marsden, pp. 129–146 (Longman, & Co., London, 1811).—"Fructus Piperis Nigri," in Pharmacographia, Flückiger & Hanbury, pp. 576–582.——"*Piper nigrum*," in Medicinal Plants, Bentley & Trimen, No. 245, 6 pages.——"The Pepper Plant (*Piper nigrum*)" in Cultural Industries for Queensland, Bernays, pp. 157–160 (Govt. Printing Office, Brisbane, 1883).——"*Piper nigrum*" in Dict. Econ. Prod. India, Watt, vi. part 1A, 1892, pp. 260–267.——"Poivre Noir," in Les Drogues Simples d'Origine Végétale, Planchon & Collin, i. pp. 407–412 (Octave Doin, Paris, 1895).——Note on the Cultivation of Black Pepper in Assam, Basu, Agric. Dept. Assam, Bull. No. 4, 1898, pp. 1–5 (Assam Secretariat Printing Office, Shillong).——"Cultivation of Pepper in the Bombay Presidency," Mollison in Agric. Ledger, No. 3, 1901, pp. 33-40.——"Pepper Cultivation in Malabar," Tropical Agriculturist, xxv. 1905 (1906), pp. 563–567.——The Varieties of Cultivated Pepper, Barber, Bull. No. 56, 1906, Dept. of Agric. Madras, pp. 123–133, vars. "Balmacotta," "Kallivalli" and "Cheriakodi."——"All about Pepper," Ferguson, pp. 1–94 (A. M. & J. Ferguson, Colombo, 1907).——"*Piper nigrum*" in Comm. Prod. India, Watt, pp. 896–901 (John Murray, Albemarle St., London, 1908).——Die Piperaceae von Java (Beitrag zur Kenntniss der Flora von Java, No. 11), Skoorders, pp. 1–75 (Johannes Müller, Amsterdam, 1908) including *P. longum* and *Cubeba*.——"The Cultivation of Pepper in Sarawak," Hewitt, in The British North Borneo Herald, 1908, Aug. 1st, pp. 148–149; Aug. 17th, p. 157.——"Trang Pepper," Derry, in Str. Sett. & Fed. Malay States Bull. viii. No. 4, 1909, p. 240.——"Black Pepper" in Materia Medica, Greenish, pp. 157–159 (J. & H. Churchill, London, 1909).——"Black Pepper," in Spices, Ridley, pp. 240–312 (Macmillan & Co. Ltd., 1912).——"Pepper-Growing in Upper Sarawak," Dalton, Sarawak Museum Journal, Feb. 1912, pp. 52–60.——"De Peper-Cultuur op Banka," Rutgers, in Mededeelingen van het Laboratorium voor Plantenziekten, Batavia, No. 19, 1916, pp. 1–36, illust.; with an English Summary.

Piper umbellatum, *Linn.* Fl. Trop. Afr. VI. Sect. 1, p. 144.

Ill.—Jacq. Ic. Pl. Rar. ii. t. 216; Desc. Ant. i. t. 37; Wight, It. Pl. Ind. or. v. t. 1925 (*Pothomorphe subpeltata*); Saunders & Baker, Refugium Botanicum, iv. t. 230.

Vernac. names.—Poponde (Sierra Leone, *Scott Elliot*); Jaborandi ou Bihimitrou (Carib, *Descourtilez*); Bois d'Anisette (Antilles, *Descourtilez*).

Lagos and widely distributed in Upper and Lower Guinea; in Mozambique, East Africa and also in the Mascarene Islands, Tropical Asia and America.

Leaves eaten by the natives, Sierra Leone (Scott Elliot, Herb. Kew; Col. Rep. Misc. No. 3, 1893, p. 43).

A shrub 4–5 ft. high, found in the Cameroons at an elevation of 3000 ft. (Mann, Herb. Kew), in Bangala, Congo at 1000 ft. altitude, parasitic on palms and as a climber, Sierra Leone (Scott Elliot, l.c.).

PEPEROMIA, Ruiz & Pav.

Peperomia pellucida, *H. B. & K.*; Fl. Trop. Afr. VI. Sect. 1, p. 149.

Vernac. name.—Rinrin (Lagos, *Dawodu*).

Lagos; Mt. Patteh (N. Nigeria) and cosmopolitan in the Tropics.

Plant used as a pot-herb; Lagos (MacGregor & Dawodu, Herb. Kew), and leaves included in "Agbo" (*see* p. 50).

MYRISTICACEAE.

PYCNANTHUS, Warb.

Pycnanthus Kombo, *Warb.*; Fl. Trop. Afr. VI. Sect. 1, p. 158.

Ill.—Warburg, Muskatnuss, t. 4, f. 9 (seed and section of seed); Thonner, Blütenpfl. Afr. t. 50; Tropenpfl. 1911, t. 9 (habit).

Vernac. names.—Akomu (Yoruba, *Foster*, *Dodd*, Ibadan, *Punch*); Acoomoo (Lagos, *Smetham*); Ote (Gold Coast, *Tudhope*, *Chipp*); Combo (Gaboon, *Christy*); Mutugo (Angola, *Christy*); Ikom (Pahouin, Congo, *De Wildeman*); Mochan (Benin, *Leslie*); Tamakwa (Ibo, *Leslie*); Mutaje, Mutuge or Entuge (Golungo Alto, *Welwitsch*); Cachão (Island of St. Thomas, *Welwitsch*); Moxadeira Brava ("Wild Nutmeg Tree") (Angola, *Welwitsch*); Kpoye (Sierra Leone, Col. Rep. Ann. No. 737, 1912, p. 34; Misc. No. 88, 1914, p. 568.

Lagos, Ibadan, &c. in Nigeria and widely distributed in Upper and Lower Guinea, Nileland, &c.

The seeds are said to yield 72 per cent. of a fatty oil and have been imported into Liverpool from St. Thomas as an oil-seed (Samuelson & Son, Mus. Kew; Christy New Comm. Pl. &

Drugs, No. 8, 1885, p. 26; Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 21); the Kernels have yielded 70 per cent. of solid brown fat which could probably be used for soap-making after being decolorised (Col. Rep. Ann. No. 737, 1912, p. 34; Misc. No. 88, 1914, p. 568); readily inflammable and burning like tapers, Golungo Alto (Welwitsch) and contains a red juice, used for skin disease, Sherbro (Garret, Herb. Kew). A juice from the bark is used as a mouth lotion for the common complaint "thrush," by the natives Ibadan, S. Nigeria (Punch, Herb. Kew). The wood is said not to last (Foster, Nig. Trees & Pl. p. 60) to be soft and perishable (Punch, l.c.); but "fairly good for roof shingles," Ashanti (Chipp, No. 73, 1912, Herb. Kew); white, readily attacked by ants, used for joinery and cabinet-making, Congo (De Wildeman, Pl. Util. Congo, ii. 1904, p. 362).

A diœcious tree 30–120 ft. high; 3–5 ft. in diam. "does not shed its leaves during blossoming," Ibadan Forest Reserve (Punch, l.c.), female flowers on the branchlets of 2 or 3 years' growth below the leaves corymbosely clustered, the male flowers are arranged in dense thyrsoid panicles which fall together under the male trees, forming heaps on the ground that resemble human ordure, hence the negro name (*see* above) in Golungo Alto, meaning "dirt tree" (Hiern, Cat. Welw. Afr. Pl. iv. p. 913). Welwitsch (l.c.) further describes the female tree as being very productive, each tree bearing many "alquiers" (23 pints) of fruits.

Ref.—"*Pycnanthus* Seeds," in Bull. Imp. Inst. vi. 1908, pp. 377–380 and Col. Rep. Misc. No. 88, 1914, pp. 567–570.

MYRISTICA, Linn.

Myristica fragrans, *Houtt.* Handleid. iii. p. 333.

A tree, 30–40 ft. high, with spreading branches; diœcious. Leaves about 4 in. long and 2 in. wide, alternate, lanceolate, acuminate, coriaceous, shining dark green above, pale green below. Male flowers, small, cymose, yellowish; female flowers solitary or two or three together; small yellowish. Fruit fleshy more or less globular, about 2 in. or more through, orange yellow. Seed ("Nutmeg" of commerce) globular-oval about 1 in. in diam. hard, aromatic, enclosed in a scarlet arillus (the "mace"—faded in colour—of commerce).

Ill.—Plukenet, Phytog. t. 209 (*Nux moschata* &c.); Sonnerat, Voy. Nouv. Guinée, tt. 116, 117, 118; Rumpf, Amb. ii. t. 4 (*Nux myristica*); Gaertner, Fruct. Sem. Pl. i. t. 41 (*M. officinalis*); Plenck. Ic. t. 425 (*M. officinalis*); Dict. Sc. Nat. t. 14 (*M. aromatica*); Roxb. Pl. Corom. t. 274 (*M. aromatica*); Hayne, Darst. Beschr. Gewächse, ix. t. 12 (*M. moschata*); Hooker, Exotic Flora, ii. tt. 155, 156 (*M. officinalis*); Bot. Mag. tt. 2756, 2757 (*M. officinalis*); Nees von Esenbeck, Plant, Medic. Düsseld. t. 133 (*M. aromatica, moschata*); Desc. Ant. vii. t. 562

(*M. officinalis*); Woodville, Med. Bot. iv. (1832) t. 238 (*M. moschata*); Steph. & Ch. Med. Bot. t. 104 (*M. moschata*); Martius, Fl. Bras. v. pt. i, t. 38; Berg. & Schmidt, Darst. & Beschr. Pharm. ii. t. 13A; Baillon, Hist. Pl. ff. 298–306; Bentl. & Trimen, Med. Pl. t. 218; Köhler, Med. Pflan. ii; Warburg, Muskatnuss (1897) t. 1, t. 3, ff. 1–6; Karst. & Schenck, Veg. bild. i. t. 17; Wiener, Ill. Gart. Zeit., 1904, p. 272, t. 66 (habit & fl. branch); Freeman in Journ. Roy. Hort. Soc. xxix. 1904, p. 638, f. 194; Ridley, Spices, p. 95 (habit).

Nutmeg.

Native of the Moluccas or Spice Islands: but widely spread by cultivation, to the West Indies, Mauritius, Africa—Zanzibar, &c. and South America. The important trade sources, however, of "nutmegs" and "mace" are few—chiefly, Banda Islands, Java, Sumatra and other East India Islands, Penang and Singapore; to a smaller extent, West Indies,—Grenada (*see* Kew Bull. 1891, p. 145) from whence in 1911, 6,496 barrels and 456 half barrels of nutmegs with 292 cases and 341 bags of mace were exported (Col. Rep. Ann. No. 472, 1912, p. 9); and Mauritius. In Zanzibar the tree has been established for approximately 100 years. It was introduced to Calabar, West Africa from Kew in 1900; grown in the W. Province for distribution (Farquhar, Rep. For. & Agric. W. Prov. Sept. 30th, 1907); said to have grown well at Heddle's Farm, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 21).

It is reported that the West Indian Nutmegs owing to their inferiority are not sold as such—"they are shipped principally from Grenada to London, graded as to size and mixed with Singapore nutmegs and then shipped to this Market [U.S.A.] and sold under the trade name of Singapore nutmegs" (Agric. News, Barbados, 1910, p. 84). The price of West Indian nutmegs in 1910 was from 10–20 per cent. below those of Singapore (l.c.); the prices now (1919) are "West India"—118's at 1*s*. 3*d*.; 81's to 91's, slightly wormy 10*d*. to 10½*d*.; "Garbled Bombay" 76's to 85's 1*s*. 5*d*. to 1*s*. 6*d*.; 90's to 103's 1*s*. 3½*d*. to 1*s*. 4*d*.; defective 8½*d*. per lb. (Chem. & Druggist, Jan. 11, 1919, p. 53).

The seed or "nutmeg" is the principal trade product, but the "mace" (or arillus) is also sold as a spice. The process of "liming" nutmegs although not a necessity, is an important feature of the preparation—it "consists of shaking the nutmegs in a cask with a handful of recently prepared well-dried lime" (Chem. & Druggist, May 23rd, 1908, p. 816). The pericarp or outer fleshy part of the fruit makes an excellent preserve (Kew Bull. 1888, p. 179).

An oil is also obtained from the seeds used in perfumery, in soap-making and as a flavouring in cooking. Nutmegs yield from 8–15 per cent. of volatile oil on distillation (Parry, Chem. Ess. Oils, p. 240) and the "Mace" from 4–15 per cent. (l.c.

p. 242). The fixed oil or "Nutmeg butter" obtained by expression while hot, is of a yellow colour, yield about 9 oz. from 2 lb. of nutmegs, 28 per cent. (Flückiger & Hanbury, Pharmacog. p. 507), used medicinally. There are specimens of oil of Nutmegs ("Miniak Pala" of Banda Island), Nutmeg Butter, Mace Paste and fruits from St. Lucia, British Guiana, Trinidad, Mauritius and the usual trade sources in the Museum at Kew.

Plants are propagated by seed, raised in nursery beds and planted out in permanent places or sown at stake. A distance of about 20–25 ft. is allowed between each tree and male trees should be weeded out as early as possible after the first flowering, to about one in ten or fifteen. The female trees begin to bear at about 5 years old increasing in yield to maturity at about 20 years. The fruits ripen more or less throughout the year. The nuts are dried as gathered, the shell removed and the "mace" separated. Liming, as above described, if not done before shipment is done to meet certain requirements of the trade on arrival in the country of import; they are usually graded according to size—so many per lb.

The main requirements are a tropical climate, a good rainfall —upwards of 100 in. and a rich well-drained soil.

Apart from cultivation in regular plantations the tree is a handsome one and suitable for avenues and shelter belts.

Fuller particulars are given in the illustrated works above mentioned and in the following :—

Ref.—" Myristica," Oleum Myristicae Expressum " and " Macis " in Pharmacographia, Fluckiger & Hanbury, pp. 502–509.——" Nutmeg," in Cultural Industries for Queensland, Bernays, pp. 131–136 (Govt. Printer, Brisbane, 1883).——" *Myristica fragrans* " in Dict. Econ. Prod. India, Watt, v. part. 1, 1891, pp. 311–314.——" The Useful Varieties of Nutmegs," Warburg in Pharm. Journ. [3] xxiii. 1892, pp. 11–12.——" The Poisonous Action of Nutmegs," Daschewski, Year Book, Pharmacy, 1895, p. 139).——Die Muskatnuss, Warburg, pp. 1–628, illustrated (Verlag von Wilhelm Engelmann, Leipzig, 1897).——Myristica spp : The Fats of Indian Nutmegs, Hooper, Agric. Ledger, No. 3, 1907, pp. 17–24.——" Notes on the Mace of Commerce," Holmes, in Museum Report, Pharm. Soc. Gt. Britain, 1907–1910, pp. 24–27 ; " The Nutmegs of Commerce," l.c. pp. 29–39.——" Nutmeg Cultivation," Agric. News, Barbados, 1908, p. 75.——" *Myristica fragrans* " in Comm. Prod. India, Watt, pp. 791-792.——" Nutmegs of Commerce," Holmes in Pharm. Journ. [4] xxviii. 1909, p. 419-430 ; pp. 459-461.——" The State of the Nutmeg Industry," in The Agric. News, Barbados, 1910, pp. 84–85.——" Nutmegs and Mace," Bull. Imp. Inst. 1910, p. 3 ; 1912, pp. 43–44 ; report on samples from Mauritius.——" Nutmegs and Mace," in Spices, Ridley, pp. 94–154 (Macmillan & Co. Ltd. London, 1912).——" Nutmegs and Mace : Their History, Botany, and Cultivation," in The Chemist & Druggist, Jan. 31st, 1914, pp. 160-162.

LAURINEAE.

Cinnamomum, Blume.

Cinnamomum Camphora, *T. Nees & Eberm.* Handb. Med. Pharm. Bot. ii. p. 430.

An evergreen tree upwards of 30 ft.; but old trees may reach 90 or 100 ft. with a trunk 2–3 ft. in diam. Leaves alternate, oval, acuminate, 3-6 ins. long; 2–3 ins. broad, shining green above, pale green below, with small pits in the axils of several of the principal nerves. Inflorescence paniculate, axillary; flowers insignificant. Fruit a berry; single seeded, not unlike the seed of a "Sweet Pea."

Ill.—Nees von Esenbeck, Plant. Medic. Düsseld. t. 130 (*Laurus Camphora*); Woodville, Med. Bot. iv. (1832) t. 236 (*Laurus Camphora*); Hayne, Darst. Beschr. Gewächse, xii. t. 27 (*Camphora officinarum*); Wight, Ic. Pl. Ind. Or. v. t. 1818 (*Camphora officinarum*); Berg & Schmidt, Darst. & Beschr. Pharm. ii. t. 10e (*Camphora officinarum*); Bentl. & Trimen, Med. Pl. t. 222 (Drawn from a tree in the Royal Gardens, Kew; the flowers added from a specimen in the British Museum—grown in Mauritius; the fruit added from Berg & Schmidt l.c.); Köhler, Med. Pflan.; Zippel, Ausl. Handels Nährpfl. t. 24 (*Camphora officinarum*); Planchon & Collin, Les Drogues Simples, i. p. 375 f. 298; U.S. Dept. Agric. Div. Bot. Circ. No. 12, 1897, p. 1; Tropenpfl. ii. 1898, p. 88; Shirasawa, Ic. Jap. i. t. 43, ff. 15–29 (fl. & fr. br. & wood specimen); Adelaide Bot. Gard. Off. Souv. 1907, p. 43 (*Camphora officinarum*); Miyoshi, Atlas Japan Veg. xii. 1908, t. 80 (Forest of *C. Camphora*, Horisha, Formosa); Lister, Rep. Union S. Africa, Dec. 31st, 1911 (Tree-age 14 years at Umtata, Cape Prov.); Longo Biagio, L'Orto Inst. Bot. Univ. de Siena (1915), p. 23.

Camphor, Camphor Laurel.

Native of China, Formosa and Japan; cultivated experimentally in Old Calabar — a tree about 10–15 ft. high in 1898, Gold Coast, Natal, Amani (East Africa), Konakry (French Guinea), Algeria, India, Burma, Fed. Malay States, Ceylon, West Indies, Florida, California, &c., but nowhere does the cultivation appear to have got beyond the experimental stage. Japan with its Formosan production controls the market in the camphor—well known for its medicinal uses, in the manufacture of celluloid and in Japan for its use in lacquer work. The production of camphor and oil—obtained by distillation from the wood chiefly—and also from the leaves is of the first importance; but the wood is valuable for cabinet work—much used in Central China (Henry, Fl. Sinensis, ii. p. 371) and in the Chengtu Prefecture where no camphor is distilled the wood is sawn into thin flat slabs beautifully marked, which under the name of "Ying Mu" is made into small boxes and dressing cases and used for facing inferior woods in the manufacture of wardrobes and similar articles of furniture; it is less expensive

than the "Nan Mu" (*Machilus Nanmu*, Hemsl.) which together with the camphor tree supplies wood for the best furniture (Hosie, Rep. Prov. of Szechuen, No. 5, 1904, p. 54). The weight is given at 39 lb. per cubic ft. (Gamble, Man. Ind. Timb. p. 564). A specimen in the Kew Museum ("Kusonoki" from Japan, St. Louis Exhib. 1904) has sp. gr. 0·519 = 32 lb. per cubic ft. —this wood at the time of the St. Louis Exhibition was valued in Tokio at 55 dollars per 100 cubic ft.;—and specimens of the wood collected in Formosa (W. R. Price 1914) show (1) "True Camphor," sp. gr. 0·5317 = 33 lb. per cubic ft. and (2) "Shu" from a tree yielding oil only, sp. gr. 0·6746 = 42 lb. per cubic ft.

The fruits are eaten by chickens and birds and in Japan and China they are used to make a kind of tallow.

The tree is useful for ornamental purposes for which it is largely grown in Southern Europe and South America.

Propagation may be effected by seed or cuttings, raised in Nurseries and planted out at distances of from 10–15 ft.—or where it is proposed to distil loppings, planting as hedges is suggested—in good sandy loam or fairly rich well drained soil. Seeds (usually the berries are sown) germinate slowly; they may take from 2–6 months (Eaton, Malaya) or 3–5 months (Hood & True, Florida) and the percentage (about 10 per cent.) of germination is uncertain, so that fresh seed is important. Recent investigations go to show that when the pulp is removed before sowing the percentage of germination is considerably increased (*see* Paper by Russell (1919) *seq.* and Kew Bull. 1920, p. 45.)

The yield of camphor and oil is very uncertain; it varies very considerably even in Formosa, where it is reported that trees "in the north give as high as 100 parts of camphor to 75 parts of oil, while in the extreme south the quantity of oil obtained to the same quantity of camphor is as high as 400 parts" (Cons. Rep. Ann. No. 4996, 1912, p. 11) and Mr. W. R. Price (*see* note above as to woods) in a communication to the Director, dated Formosa, July 24th, 1912, states in reference to trees there that "an experiment has proved that the same tree will produce more camphor and less oil in the winter." Mr. Boodle has examined the Formosan woods of "True" and "Shu" camphor (*see* above) in the Laboratory at Kew and suggests that "the anatomical differences noted in the two specimens might perhaps be dependent entirely on conditions of growth; but in order to gain any opinion on the subject, it would be necessary to examine many specimens, and to obtain information as to the habitats, &c. of the trees from which they were cut." Other hypotheses have been put forward to account for this difference—more particularly in reference to cultivated trees in various parts of the world. A parallel case is that of "Chicle" (*Achras Sapota*, p. 401) and in like manner specimens and information are being collected by the Director in order to decide if possible, whether the variation is due to botanical differences or to conditions of soil and climate. Apart, however, from the uncertainty of camphor production it is

suggested that the tree is worth growing for ornament, as shelter for smaller plants or as hedges and for the timber. It would probably succeed well in Nigeria on the higher altitudes where the rainfall is good—the camphor plantations at Amani, East Africa are situated at 1000, 750 and 500 metres above sea level (Schimmel & Co. Semi Ann. Rep. Oct. 1910, p. 28) and in Burma the tree has been found to thrive at from 3000–4000 ft. (Rep. Forest Adm. Burma for 1909–10).

Full particulars of cultivation, distillation &c. will be found in the following works.

Ref.—" Camphora," in Pharmacographia, Flückiger & Hanbury, pp. 510–519.——" *Cinnamomum Camphora* " in Med. Plants, Bentley & Trimen, No. 222, 7 pages (J. & H. Churchill, London, 1880).——" Camphor," in Dict. Econ. Prod. India, Watt, ii. (1889), pp. 84–93.——Camphor Leaf Oil, Hooper, Agric. Ledger, No. 5, 1896, pp. 1–5.——The Camphor Tree (*Cinnamomum Camphora*), Dewey, U.S. Dept. Agric. Div. Bot. Circ. No. 12, 1897, pp. 1–8.——" Die Kultur des Kampherbaums," in Der Tropenpflanzer, ii. 1898, pp. 87–89.——" Camphor (*Cinnamomum Camphora*)," in Kew Bull. 1899, pp. 57–68; reprint in Bull. Bot. Dept. Jamaica, vi. Dec. 1899, pp. 177–186.——" Camphor," Bamber & Willis, Royal Bot. Gardens, Ceylon, Circ. i. No. 24, Nov. 1901, pp. 325–343.——" Production of Camphor," in Bull. Imp. Inst. iii. 1905, pp. 353–363.——" Camphor Oil," in Semi-Annual Report, Schimmel & Co. Oct.–Nov. 1906, pp. 15–21.——" Cultivation of Camphor," in The Agric. News, Barbados, v. Sept. 22nd, 1906, p. 299.——Mr. Kelway Bamber's Paper on Camphor," in Proc. & Journ. Agric.-Hort. Soc. India, July–Dec. 1906, pp. 102–112 (The Agric. Hort. Soc. Alipur).——Propagation of Camphor, Knock, Royal Bot. Gardens, Ceylon, Circ. iv. No. 3 May 1907, pp. 13–20 (and A. M. & J. Ferguson, Colombo).——" Camphor Oil," in Semi-Annual Rep. Schimmel & Co., April 1907, pp. 15–25; Oct. 1910, pp. 24–29.——" Distillation of Camphor"; Kew Bull. 1907, pp. 88–90.——" The Cultivation of Camphor: A possible Industry for Natal," in Natal Agric. Journ. xi. Jan. 1908, pp. 24–33.——" Les Végétaux Producteurs: De Camphire au Tonkin," Dubard, in L'Agric. prat. pays chauds, viii. 2, 1908, pp. 193–200.——" Synthetischer Kampfer," in Der Tropenpflanzer, xii. 1908, pp. 197–199.——" Camphor," in The Comm. Prod. India, Watt. pp. 244–247.——" Natural and Synthetic Camphor," Houseman in Science Progress, iii. 1908, p. 60.——" Camphor Cultivation and Its Future," Olsson-Seffer, in The American Review of Tropical Agric. i. Feb. 1910; pp. 55–62 (Tropical Agric. Publishing Co. Apartado, Mexico).——"Camphre de Synthèse et Camphre naturel: Essais de Culture dans les États fédérés Malais," Cayla, in Journ. d'Agric. Tropicale, Paris, x. Jan. 1910, pp. 8–11; abstract in Agric. News, Barbados, x. June 10th, 1911, p. 187.——" Camphor Cultivation in the United States," Hood & True: reprint from Year Book,

Dept. Agric. U.S.A. 1910, pp. 447–460; Extract in Agric. News, Barbados, xi. Jan. 6th, 1912, p. 5.——"Camphor from *Cinnamomum Camphora*: Cultivation and Preparation in the Fed. Malay States," Eaton, Dept. of Agric. Fed. Mal. States, Bull. No. 15, 1912, pp. 1–38; abstract in Agric. News, Barbados, xi. Sept. 14th, 1912, pp. 302–303.——"Précisions nouvelles sur l'exploitation du Camphrier," Baillaud, in Journ. d'Agric. Tropicale, xii. Dec. 31st, 1912, pp. 362–367.——"Camphor Oil and Crude Camphor" from the Fed. Malay States," in Bull. Imp. Inst. xi. 1913, pp. 46–48.——"Camphora," in Handb. der Pharmacognosy, Tschirch, Lieferung 36, Jan. 20th, 1914, pp. 1110–1138, illustrated.——"Investigations on the Camphors of Mauritius," Stockdale, Dept. of Agriculture, Mauritius, Bull. No. 4, Sci. Series, 1916, pp. 1–14.——"Camphor Oil from the Fed. Malay States and Mauritius," in Bull. Imp. Inst. xiv. 1916, pp. 577–585; abstract in Agric. News, Barbados, xvi. Oct. 6th, 1917, p. 317.——"Camphor Cultivation" in The Perfumery and Essential Oil Record, Jan. 1919, p. 3.——"On Camphor Oil and the Possibility of Increasing Camphor Cultivation in the British Empire," l.c. March, 1919, pp. 57–59; "Synthetic Camphor," l.c. pp. 59–60.——"Camphor," in Report Agric. Dept. Dominica, 1918–1919 (Issued 1919) pp. 5–7.——"Effect of Removing the Pulp from Camphor Seed on Germination and the subsequent Growth of Seedlings, Russell, U.S. Dept. Agric. pp. 223–238, illustrated (Govt. Printing Office, Washington, 1919); Reprint from Journ. Agric. Research, xvii. Aug. 15, 1919.——"Camphor," in Agric. News, Barbados, xviii. Dec. 13th, 1919, pp. 385–386.——"Effect of removing the pulp from Camphor Seed on Germination and the Subsequent Growth of the Seedlings," Kew Bull. 1920, pp. 45–47.——"A Machine for Trimming Camphor Trees," Perfumery and Essential Oil Record, June 1920, pp. 226–227.

Cinnamomum zeylanicum, *Nees*, in Wall. Pl. As. Rar. ii. p. 74.

A tree 20 ft. and upwards, with dense broad head. Leaves 3–6 in. long 2–3 in. broad. Flowers insignificant, yellow, borne in loose panicles near the ends of the branches. Fruit ovoid fleshy set in a cup-like base.

Ill.—Rheede, Hort. Mal. i. t. 57; Bot. Mag. t. 1636 (*Laurus Cassia*); Dict. Sc. Nat. t. 12 (*Laurus Cinnamomum*); Bot. Mag. t. 2028 (*L. Cinnamomum*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 128 (*Laurus Cinnamomum*); Steph. & Ch. Med. Bot. t. 127 (*L. Cinnamomum*); Wight, Ic. Pl. Ind. or. i. tt. 123, 128, 129, 134; Berg & Schmidt, Darst. & Beschr. Pharm. i. t. 5c; Bedd. Fl. Sylv. t. 262; Bentl. & Trimen, Med. Pl. t. 224; Köhler, Med. Pflan.; Talbot, For. Fl. Bombay, ii. p. 388, f. 463; Bull. Agric. Congo Belge, iv. 1913, p. 194 f. 71 (Plantation at Eala).

Cinnamon.

Native of Ceylon; Cultivated on an experimental scale in many countries but limited to Ceylon, India, and Java as important commercial sources of the bark.

At Old Calabar there were some good sized trees in 1897, fruiting regularly; but in West Africa the only particulars available of an experiment in bark production, come from the Gold Coast. A sample of quills grown at Aburi was described as "stout and coarse but of good flavour and worth about 5*d*. to 6*d*. per lb. in London (1906—when the price of good cinnamon was 8*d*. to 9*d*. per lb.) and it was considered that "cinnamon of good quality might be obtained from West Africa if more care was taken in the selection and preparation of the bark" (Evans, Dept. of Agric. Gold Coast, Ann. Rep. 1907 (for 1906) p. 11; Chem. & Druggist, Oct. 19, 1907, p. 624; Bull. Imp. Inst. 1907, p. 184).

It is essential to observe that "the product was from an old bush that had been left standing in order to obtain seed for propagating purposes" (Evans, l.c.), which would account for the statement "stout and coarse" in the valuation. Another sample of bark—"rather stout quills of fair quality but of poor flavour" was valued at 1*s*. per lb. *ex* wharf, London, (Jan. 1918); it gave a high yield of oil of good quality and a few cwts. were added for further examination (Bull. Imp. Inst. 1918, pp. 146–147). Other records might be quoted as to distribution—Sierra Leone in 1792 (Col. Rep. Misc. No. 3, 1893, p. 21), Zanzibar—introduced almost 70 years ago and still grows in many places: but no attention paid to cultivation (Kew Bull. 1892, p. 90); cultivated, banks of the River Dande near Bombo, Barra de Dande. Introduced from the island of St. Thomas; cultivated and almost wild in Princes Island (Hiern, Cat. Welw. Afr. Pl. iv. p. 914), Grenada—"an increased demand for cinnamon has caused it to be advised that more trees shall be planted" (Rep. Bot. St. Grenada, 1909–10, p. 16), Queensland (Bernays, Cult. Ind. for Queensland, 1883, p. 36), Eala (Equator) (Bull. Agric. Congo Belge iv. 1913)—all of which go to show that this appears to be one of the products that notwithstanding its easy growth never seems to have become of any value away from its original home; due in the first place probably to the limited demand; and it suggests that if all become successful in cultivation, it may amount merely to a transfer of the trade from one country to another.

The bark as a spice is the principal use and the quills that come into commerce are cut from shoots approximately two years' old, when they are about 3 or 4 ft. long and about ½ in. thick; but an oil is distilled from waste pieces and also from the leaf and root. The oil from the bark is the most valuable and may be obtained from bark grown as for spice, under a system of coppicing or from older trees.

The tree may be propagated from seed, cuttings or layering, and in a plantation require from 6–12 ft. distance between each plant.

Full particulars of the cultivation, yield, preparation, &c. will be found in the following works.

Ref.—" Cortex Cinnamomi " in Pharmacographia, Flückiger & Hanbury, pp. 519–527 (Macmillan & Co. London, 1879).——" *Cinnamomum zeylanicum*," in Med. Plants, Bentley & Trimen, No. 224, 5½ pp.——" All about Cinnamon," in All about Spices, Ferguson, pp. 201–274 (A. M. & J. Ferguson, Colombo, 1889).——" Cinnamon Bark from the Gold Coast, in Bull. Imp. Inst. v. 1907, p. 184.——" Cinnamon Bark Oil," l.c. vi. 1908, pp. 111–112, from Seychelles.——" *Cinnamomum zeylanicum*," in Commercial Products of India, Watt, pp. 313–316.——" Cinnamon Bark & Leaves," in Bull. Imp. Inst. viii. 1910, p. 2, samples from Mauritius.——" Commercial Cinnamon and Cassia," Sindall in American Journ. Pharmacy, lxxxiv. 1912, pp. 496–499 with analyses of " Broken China," " Ceylon Chips," " Broken Batavia," " Saigon," " Seychelle," " Pakhoi Rolls," " Kwangsi Rolls " and " Coarse Corintjie."——" Cinnamon " in Spices, Ridley, pp. 205–226 (Macmillan & Co. Ltd. London, 1912).——" Cinnamon : Its History, Botany, Cultivation and Commerce," illustrated with Plantation Photographs—Cutting, Peeling, Drying and Sorting Cinnamon, in the Chemist and Druggist, March 8th, 1913, pp. 391–393 (or pp. 115–117).——" Further Investigations on the Valued Cinnamon Bark from the Gold Coast," Bull. Imp. Inst. xvii. 1919, pp. 189–191.

PERSEA, Gaertn.

Persea gratissima, *Gaertn. f.* Fruct. iii. (1805), p. 222.

A tree, 20–30 ft. or more high, trunk 12–18 in. diam. Leaves alternate, coriaceous, oblong. Flowers in panicles. Fruit pear-shaped or more or less globular. ; 3–4 in. long, about 2 in. through, containing one large seed.

Ill.—Sloane, Voy. Jamaica, ii. p. 132, t. 222, f. 2 (*Prunifera arbor*); Gaertner, Fruct. Sem. Pl. iii. t. 221; Dict. Sc. Nat. t. 13; Tussac. Ant. iii. t. 3 (*Laurus Persea*); Bot. Reg. (1829) t. 1258; Desc. Ant. viii. t. 579 (*Laurus Persea*); Wight, Ic. Pl. Ind. or. v. t. 1823; Lemaire, Le Jard. Fl. t. 252; Bot. Mag. t. 4580; Martius, Fl. Bras. v. pt. 2, t. 105, f. 1 (fruit); Ill. Hort. xxxvi. 1889, t. 75 (fruit); Agric. Gaz. N. S. Wales ii. Aug. 1891, t. 45; Rev. Hort. 1900, pp. 546 (fl. br., fruit), 566–567; Transv. Agric. Journ. ii. Oct. 1903, t. 22; Freeman, in Journ. Roy. Hort. Soc. xxix. 1904, p. 640, f. 196; Bol. Mus. Paraense, vi. 1909, p. 58 (leaves); Cellon, Comm. Cult. Avocado & Mango, pp. 2, 9 (" Trapp " Avocado; habit), p. 25 (" Pollock," fruit), p. 29 (" Trapp," fruit), p. 33 (" Solano," fruit).

Vernac. names.—Aguacate or Ahuacate (Mexico, *Rose*); Aguacate (Porto Rico, *Cook* & *Collins*).—Avocado Pear, Alligator Pear.

Native of Tropical America and widely spread in the Tropics. In Africa it has been grown in Nigeria—there are specimens of fruit in the Kew Museum collected by Barter on the Niger Expedition (1850); the tree was growing at Old Calabar in

1896 and in 1908 the crop there was reported as enormous, 100–150 fruits sent out every week and during the quarter April to June, the amount realised from sales of the fruit was £11 12*s*. (Govt. Gaz. S. Nig. Suppl. 26th Aug., 1908, p. i.)—the Gambia (Kew Bull. 1898, p. 41), Nairobi—grows vigorously and produces huge crops of fruit (l.c. 1914, p. 268), St. Thomas—— on Monte Caffé, altitude about 2000 ft. (Hiern, Cat. Welw. Afr. Pl. iv. p. 915), &c.

Cultivated on a commercial scale in California and Florida (Cellon, *seq.*); in Jamaica from June to September the supply is very good (Kew Bull. 1888, p. 179) and in the Bahamas the fruit is in season August, September and October (l.c. p. 181).

The fruit occasionally comes into Covent Garden Market.

The tree is grown entirely for its fruit eaten fresh as dessert or as a salad. It is reported dangerous if eaten before maturity (Bot. Mag. t. 4580). The seed is stated to be used in the West Indies for making ink (Technologist, ii. 1862, p. 241) and Barham is quoted (Bot. Mag. l.c.) as stating "if you take the stone of the seed and write upon a white wall the letters will turn as red as blood and never go out till the wall is white-washed again and then with difficulty."

A rich well-drained soil and a hot climate are necessary. Fruits have been obtained as far north as the Riviera (Rev. Hort. 1891, p. 172); in England (under glass) a plant flowered at Syon in 1829 (Rot. Reg. t. 1258) and at Kew in 1851 (Bot. Mag. t. 4580), but there appears to be no record of a tree having fruited.

There are several varieties under cultivation and the tree may be propagated by seeds or by grafting; beginning to bear in about five years; cultivation in general same as for mango (p. 171).

Ref.—"*Persea gratissima*: Avocado Pear," &c. in Bull. Misc. Inf. Trinidad, ii. Oct. 1896, pp. 217–218.——"Avocado Pear," in Dip. & Cons. Report, Misc. No. 408, 1896, "Fruits and Fruit Trade of Madeira," pp. 6–7.——The Avocado in Florida: Its Propagation, Cultivation and Marketing," Rolfs, U.S. Dept. Agric. Bureau of Plant Industry, Bull. No. 61, 1904, pp. 1–33, pls. i–iv (Govt. Printing Office Washington).——The Avocado: A Salad Fruit from the Tropics, Collins, U.S. Dept. Agric. Bureau of Plant Industry, Bull. No. 77, 1905, pp. 1–49, pls. i.–viii.; abstract in Agric. News, Barbados, v. Aug. 25th, 1906, p. 262.——Marketing Hawaiian Fruits, Higgins, Hawaii Agric. Exp. Station, Bull. No. 14, 1907, pp. 1–44, including "Avocado" report of experimental shipments; abstract in Agric. News Barbados, vi. Dec. 28th, 1907, "Avocado Pears Preparation and Shipment," p. 404.——"Sobre um caso notave, de Polymorphismo nas folhas do Abacateiro (*Persea gratissima*)," Huber, in Boletim do Museu Goeldi (Museu Paraense) vi. 1909, pp. 54–59, with plate showing variation in the leaf, ff. 1–19.——"The Development of the Avocado Industry,"

Popenoe, in Pomona College Journal of Economic Botany, i. Sept. 1911, pp. 135–148, ff. 59–65 (Dept. of Biology, Pomona College, Altadena, California).——The Avocado in Hawaii, Higgins, Hunn and Holt, Hawaii Exp. Station, Bull. No. 25, 1911, pp. 1–48, illustrated.——"Avocatier," in Fruits des pays chauds, Hubert, pp. 361–376 (Dunod & Pinat, Paris, 1912).——New Varieties of the Avocado for California, Ryerson, Univ. California Journ. Agric. i. Nov. 1913, pp. 29–36.——"Imported Varieties of the Avocado for California," Ryerson, in Pomona College Journal of Economic Botany, iii. Feb. 1914, pp. 426–439; illustrated.——L'Avocatier, Pynaert, in Bull. Agric. Congo Belge, v. 1914, pp. 123–172, illustrated.——Commercial Cultivation of Avocado & Mango, Cellon, pp. 1–47, illustrated (Tropical Grove, Miami, Florida, 1917).

PROTEACEAE.

FAUREA, Harv.

Faurea saligna, *Harv.*: Fl. Trop. Afr. VI. Sect. 1, p. 209.

Ill.—Hooker, Lond. Journ. Bot. vi. 1847, t. 15; Transv. Agric. Journ. iii. tt. 11, f. 1, 2; 12, f. 1 (habit), t. 82.

Vernac. names.—Boekenhout (Rhodesia, *Mundy*; Transvaal, *Burtt-Davy*); Terblanz (Cape Colony, *MacOwan*); Metsatsarh (Rhodesia, *Allen*); Mseje (Shire Highlands, Zomba, *Buchanan, Purves*); Gurahorgwe (Chindao, Gazaland, *Swynnerton*); Mukoka (Ruwenzori, *Dawe*).

Katagum (Dalziel, No. 393, 1907, Herb. Kew), in the countries mentioned under native names and in Mozambique and Angola.

Wood hard and durable, used for building and fencing, Rhodesia (Allen, Herb. Kew), by the natives in charcoal-making also for doors and the floors of their raised huts, Gazaland (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 186); useful mottled timber, Ruwenzori (Dawe, Herb. Kew); durable and ant-resistant and used for piles on which some houses are built and for fence posts, occasionally for furniture (Burtt-Davy, Transv. Agric. Journ. iii. 1904, p. 127). In 1916 a piece of wood believed to be this species was submitted to Kew, it had been taken from H.M.S. "Thunderer," a Trafalgar ship broken up about 1906. The specific gravity of a sample in the Museum (Dawe, No. 564, 1907) is 0·888=55·5 lb. per cubic ft. This wood examined at the Imperial Institute was reported on as a very beautifully-figured wood of medium open grain and uniform reddish-brown colour; it takes nails well, rather hard to saw and plane, turns fairly easily; but is brittle and takes a good polish; weight 58 lb. per cubic ft. (Mus. Kew).

A shrub or a tree up to 60 ft. high; at 6–8000 ft. Ruwenzori (Dawe l.c.); one of the largest trees of the open woods, near Chindle at 3500 ft.; Chimanimani Mts. at 7000 ft. in flower Sept. Nov. & Dec. Gazaland (Swynnerton, l.c.).

Ref.—"Terblanz," in Kew Bull. 1901, pp. 83–84.——The Terblanz (*Faurea saligna*), J.B.D. in Transv. Agric. Journ. iii. 1904, pp. 126–127.

GREVILLEA, R. Br.

Grevillea robusta, *A. Cunn.* in R. Br. Prot. Nov. p. 24.

A tree 80–100 ft. high (Bentham); trunk 2–3 ft. or so in diam. Leaves pinnate—11–21 pinnatifid pinnae, silky below, in all 6–8 in. long and approximately the same in breadth, larger under cultivation. Inflorescence a panicled raceme occurring on the old wood, flowers orange or tawny-orange (Bot. Mag.); but not known to have flowered in England. Fruit a follicle; seed winged, orbicular or oblong.

Ill.—Bot. Mag. t. 3184; Agric. Gaz. N. S. Wales iv. 1893 p. 676; Queensland Agric. Journ. ii. 1898, p. 66 (young plant) Maiden, For. Fl. N. S. Wales, i. t. 1; iv. p. 176; Guilfoyle Aust. Pl. p. 247; Gard. Chron. June 10th, 1911, p. 375 (var. *compacta*).

Vernac. names.—Silky oak, Gigantic Grevillea.

Native of Australia, cultivated in the Botanic Garden at Old Calabar, being mentioned as in existence there in the departmental reports of 1897, 1907, 1908, 1909 and in a recent report for Uganda an avenue of the tree is mentioned as having been planted. This is not much to say of the tree in Tropical Africa; but it would seem to be worthy of more consideration and an extended trial. Maiden (*seq.* p. 675) states that "it does well in the Tropics as experience in India, Ceylon, Jamaica, &c. has amply proved," and that it is "one of the most valuable gifts which Australia has bestowed on Ceylon; it flourishes from sea-level to 6000 ft. and we do not wonder at its great popularity and wide diffusion."

The wood is used in Australia for tallow-casks and also for cabinet work, shingles and lining boards and it has been recommended for making wine-casks—in the Kew Museum there is a cask stave from N. S. Wales and specimens of the wood ($14\frac{1}{2}$ in. diam.) from a tree 20 years old grown in the Botanic Gardens, Calcutta, blown down by a cyclone in 1864, and a piece (3 in. diam.) from a tree grown in the Temperate House, Kew (1879).

The weight is approximately 35–38 lb. per cubic ft., sometimes 45 lb. (Gamble, Man. Ind. Timb. p. 576).

A deep rich soil with a moderate rainfall are the main requirements under cultivation—"in the thick moist woods on the banks of the Brisbane river," where it is surpassed in height only by the *Araucaria* (*Bidwilli*, Hook.) of those regions (Bot. Mag. l.c.)—but "the tree resists drought in a remarkable degree" (Maiden, Useful Pl. Australia, p. 551). Apart from its value as timber tree it is worth growing for ornamental purposes. It is for this purpose highly prized in Jamaica, where a tree

40 ft. in height, with a girth of 3 ft. at 6 in. from the ground flowered (at St. Andrew's Rectory) after seven years from the time of planting out as a seedling (Maiden, Agric. Gaz. N. S. Wales, *seq.* p. 675, from Bull. Bot. Dept. Jamaica, Nov. 1888). Said to be rather brittle, so that it should not be used to plant in windy places. In S. India, Ceylon and Java it has been used as a shade plant in tea plantations (Gamble, l.c.).

The var. *compacta* is described as of denser growth than the type and more handsome foliage; it received an award of merit from the Royal Horticultural Society in 1911 (Gard. Chron. l.c.).

Ref.—"The Silky Oak," Maiden, in the Agric. Gaz. N.S. Wales, iv. Sept. 1893, pp. 673-676.——"Gomme Résine de *Grevillea robusta*," in Gommes, Résines, De Cordemoy, Annales l'Inst. Col. Marseille, vi. 1899, pp. 292-294.——"*Grevillea robusta*, the Silky Oak," in The Forest Flora of N. S. Wales, Maiden, i. pp. 1-7 (Govt. Printer, Sydney, 1904).

THYMELAEACEAE.

Lasiosiphon, Fresen.

Lasiosiphon Kraussii, *Meisn.*; Fl. Trop. Afr. VI. Sect. 1, p. 231.

Ill.—Wood, Natal Pl. iii. t. 256; Kotschy, Pl. Tinneanea, t. 19B (*L. affinis*).

Vernac. name.—Tururibi (Katagum, *Dalziel*).

Katagum (Dalziel, No. 382, 1908, Herb. Kew), Kontagora (Dalziel, No. 53, 1906, Herb. Kew); Natal.

The thick woody root is said to be "one of the most virulent poisons in the district, Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 264; Hausa Bot. Voc. p. 98); common in the bush after burning.

L. hoepfnerianus, Vatke, is suggested as only a villous form of the above species. A specimen from the Highlands of Batoka (Kirk, 1860), native name "Kingwhane," is described thereon as an "active poison," "Kills cattle," and Wood (l.c. p. 8) states that some species of *Lasiosiphon* are used by the Natives, Natal, as a remedy in snake-bite, they have also blistering properties and have been used in sore throat.

BALANOPHOREAE.

Thonningia, Vahl.

Thonningia sanguinea, *Vahl*; Fl. Trop. Afr. VI. Sect. 1, p. 438.

Ill.—Skrifter, Nat. Selsk. vi. t. 6; Trans. Linn. Soc. xxii. 1859, t. 3; Engl. & Drude, Veg. Erde, ix. p. 657, f. 569; De Wildeman, Etudes Fl. Bangala, p. 25, f. 4.

Vernac. names.—Oyale (Lagos, *Millen*); Kubla or Kulla (Hausa, *Dalziel*).

Mt. Purdy, River Niger (Barter, Herb. Kew), Lagos and Yoruba; also found in all the large forests Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 8).

Flowers sold in market, said to be used in medicine (Millen, Herb. Kew), sold in the markets, for use as medicine, Niger (Barter, l.c. and Mus. Kew); decoction used for sore throat, laryngitis, Yorubaland (Millson, Kew Bull. 1891, p. 218); aromatic root used as a spice, Sokoto (Dalziel, Hausa Bot. Voc. p. 64).

Found as a parasite on indigenous forest trees and recently some Para rubber trees at Sapele were found to have growths of a parasitical plant on them, believed to be this species. The remedy suggested was the careful digging out and destruction of the parasites as they appeared (Johnson, Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1918, p. 19). A parasitic plant found in the bush (Dalziel, l.c.).

EUPHORBIACEAE.

Euphorbia, Linn.

Euphorbia aegyptiaca, *Boiss.*; Fl. Trop. Afr. VI. Sect. 1, p. 507.

Vernac. names.—Karar, Shanu, Rapasa (Hausa, Kano, Katagum, *Dalziel*).

Nupe, Yola, Lokoja, Katagum; also found in Lower Guinea, Cape Verde Islands, Egypt, Arabia, Syria.

Used medicinally by the Natives for its purgative effects, Nupe (Barter, No. 316, Herb. Kew); used medicinally, Kano (Dalziel, Hausa Bot. Voc. p. 65).

An annual, low-spreading stems. A weed of waste places, Yola (Dalziel, Herb. Kew); a small herb, Lokoja (Shaw, Herb. Kew).

Euphorbia Barteri, *N. E. Br.*; Fl. Trop. Afr. VI. Sect. 1, p. 597.

Vernac. name.—Kerana (Hausa, Kano, *Dalziel*).

Nupe, (Barter, No. 1012, Herb. Kew), where it was found 20 ft. high in dry rocky places. Uses suggested as similar to those of the following—hedges, fences or stockades of a substantial character being an important feature in the protection of huts and compounds; used as a fence, Kano, &c. (Dalziel, Hausa Bot. Voc. p. 61).

Euphorbia Candelabrum, *Tremaux*; Fl. Trop. Afr. VI. Sect. 1, p. 598.

Ill.—Tremaux, Voy. Soudan Orient, Atlas, tt. 13–14 (*E. canariensis*).

Sudan.

A tree 25 ft. high, with a short trunk of hard wood up to 3 ft. in diam., and the head 20–25 ft. through.

There are no specimens of this species known from Nigeria; but it is given here because of the above suggestion and the fact that Welwitsch states that *E. Candelabrum* and *E. Tirucalli* in Loanda as well as *Jatropha Curcas* in Golungo Alto provide the negroes with pitchers or stakes that take root readily when driven into the ground and grow rapidly even where no other shrub or tree can live and for this reason they are frequently used for making fences round the huts or villages of the natives (Hiern, Cat. Welw. Afr. Pl. iv. p. 939).

Euphorbia convolvuloides, *Hochst.*; Fl. Trop. Afr. VI. Sect. 1, p. 495.

Ill.—Boisser, Ic. Euphorb. t. 15.

Vernac. name.—Nonon Kurchiya (Hausa, *Dalziel*).

Lagos, Nupe, Lokoja, Sokoto, and found in Senegal, Togoland, Cameroons, Nile Land, and Mozambique.

Said to be a remedy for scorpion bite (Balfour, 1911, Herb. Kew).

Annual, about 6–18 in. high. A common field weed, Sokoto (Dalziel, Herb. Kew); a common weed, a great nuisance in gardens and roads, gravelly situations, Lokoja (Parsons, Herb. Kew).

Euphorbia hirta, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 496.

[*E. pilulifera*, Jacq., Ic. t. 478.]

Ill.—Burman, Thes. Zeyl. tt. 104, 105 f. 1 (*Tithymalus botryoides, zeylanicus* & *T. b. erectus*); Jacq. Ic. t. 478 (*E. pilulifera*); Jacq. Collec. v. t. 11, f. 1 (*E. hirta*); Greshoff, Nutt. Ind. Pl. t. 7 (*E. pilulifera*).

Vernac. names.—Nonon Kurchiya (Hausa, *Dalziel*); Emi-ile or Emile (Oloke Meji, *Dodd*; Lagos, *Dawodu*).—Australian Asthma Herb (Mus. Kew).

Lagos, Oloke Meji, Old Calàbar, and also widely distributed in Tropical Africa and other parts of the Tropics.

The var. *procumbens*, N. E. Br. has been collected in Lokoja (Parsons, No. 41) and Katagum (Dalziel, No. 414).

Used in medicine, Lagos (Dawodu, No. 22, 1899, Herb. & Mus. Kew), as a cure for asthma, Queensland (Pharm. Journ. [4] xxviii. 1909, p. 529); and as a remedy for coughs, bronchial and pulmonary disorders, but more especially in paroxysmal asthma, Australia (Potter's, Cycl. Bot. Drugs, p. 101).

Annual. A common weed a few inches to a foot or so high.

Ref.—"*Euphorbia pilulifera*" in New Comm. Plants and Drugs, Christy, No. 5, 1882, pp. 64–67.——"*Euphorbia pilulifera*," in Nuttige Indische Pl., Greshoff, pp. 25–27 (Amsterdam, 1894).——"Chemical Examination of *Euphorbia pilulifera*," Power & Browning, in Pharm. Journ. [4] xxxvi. 1913, pp. 506–510.

Euphorbia lateriflora, *Schum & Thonn.*; Fl. Trop. Afr. VI. Sect. 1, p. 552.

Ill.—Jaubert et Spach, Illust. Pl. Orient, ii. t. 130.

Vernac. names.—Fidda Saruta, Fidasarse or Fida Sartsi (Hausa, Katagum, Sokoto, *Dalziel*).

Lagos, Eppah, Katagum, Sokoto; also found in Gold Coast Colony.

Commonly used for hedges, Sokoto to Kano and Zaria (Dalziel, No. 392, 1911, Herb. Kew). Dudgeon (Agric. & For. Prod. W. Afr. p. 120) mentions that Euphorbia or thorn hedges are more common in the vicinity of Kano itself but the villages north of Kano are often entirely built of the stalks of Guinea corn (*see Sorghum*, p. 802).

A small shrub. Stems 3 ft. or more, scrambling (Fl. Trop. Afr. l.c.); 3 ft. open plains, Eppah (Barter, Herb. Kew); 3 ft. savannah forest, Gold Coast, leaves soon falling (Chipp, Herb. Kew).

Euphorbia Poissoni, *Pax.*; Fl. Trop. Afr. VI. Sect. 1, p. 560.

Kasage and Lom, N. Nigeria (Barter, No. 1491, Herb. Kew), also in Togoland and Dahomey.

Used with an apocynaceous plant to poison arrows. Similarly it may be mentioned an extract is used obtained by boiling for several hours, the bark of *E. noxia*, Pax, a shrub about 10 ft. high, of Somaliland (Fl. Trop. Afr. l.c. p. 551).

A succulent much-branched bush 5 ft. high of grotesque appearance, in dry places, Nupe (l.c.).

Euphorbia prostrata, *Ait.*; Fl. Trop. Afr. VI. Sect. 1, p. 510.

Ill.—Boisser, Ic. Euphorb. t. 17.

Vernac. name.—Emile (Lagos, *Dawodu*).

Lagos, Old Calabar, and known also from Lower Guinea, Nile Land, Mozambique, South Africa and Cape Verde Islands. A native of Tropical America.

Used in medicine, Lagos, Dawodu (No. 12, 1899, Herb. & Mus. Kew). A specimen described as "Yellow Fern-Leaf" was sent to Kew by the African Lakes Corporation in Sept. 1899.

An annual plant, spreading stems 2–8 in. long; growing on hard sandy ground, Old Calabar (Holland, No. 123, 1898, Herb. Kew).

Euphorbia pulcherrima, *Willd. ex* Klotzsch. in Otto & Dietr. Allg. Gartenz. ii (1834) p. 27.

A shrub 2–6 ft. high. Leaves opposite or alternate ovate-elliptic, sub-acute, entire, 3 or more inches long, dark-green or bright-green above, paler below. Inflorescence a terminal cyme: flowers insignificant, greenish-yellow, but subtended by large leaf-like bracts of a brilliant crimson or vermilion colour, for which the plant is remarkable.

Ill.—Bot. Mag. t. 3493 (*Poinsettia pulcherrima*) and in at least a dozen or so other works.

Vernac. names.—Pascua or Flores de Pascua (Philippines, *Blanco*)—in allusion to the plants being at their best at Christmas.—Easter Flower, Christmas Flower, Mexican Flame Leaf (Bailey), Scarlet Dazzle.

A native of Mexico and Central America—cultivated Lagos (List, Millen & Rowland), in California, &c. Cultivated in British hot-houses since 1834 (Gard. Chron. Sept. 12th, 1914, p. 190) for ornamental purposes, the brilliant crimson bracts making a good show at Christmas. Flower heads 2 ft. across, are recorded as "a most imposing and gorgeous sight at Christmastide" at Wroxall Abbey, near Warwick (l.c. Jan. 14th, 1882, p. 57) equal in size to heads 2 ft. across, grown at Santa Barbara California at Christmas on a plant 8 years old and strongly cut back every year in spring (l.c. Feb. 20th, 1897, p. 125). The "Scarlet Dazzle" is mentioned as growing on rocks by the roadside on the way from Kingston to Castleton in Jamaica (Kew Bull. 1892, p. 74).

Propagated by cuttings grown in sandy loam and the branches should be kept pruned each year just before growth commences to within two or three eyes of old or hard wood.

Euphorbia scordifolia, *Jacq.*; Fl. Trop. Afr. VI. Sect. 1. p. 501.

Ill.—Jacq. Ic. Pl. Rar. iii. t. 476; Boisser, Ic. Euphorb. t. 11.

Bure, near Lake Chad; Lokoja (Elliott, Nos. 195, 1907, and 109, 1904, Herb. Kew); and also found in Senegal, Sierra Leone Nile Land, &c.

Applied to women's breasts to increase flow of milk, Lokoja (Elliott, l.c.).

An annual weed.

Euphorbia sepium, *N.E. Br.*; Fl. Trop. Afr. VI. Sect. 1, p. 551.

Vernac. names.—Yaro or Waiyaro (Katagum, *Dalziel*); Kagua or Kaguwa (Sokoto, *Dalziel*).

Katagum, Sokoto (Dalziel, Nos. 320, 1907–08 & 528, 1910, Herb. Kew), and also found in Senegambia and Togoland.

Similar in habit to *E. lateriflora* (*q.v.*) Used by the Natives as a hedge shrub (l.c.), and for the same purpose in Senegambia (Fl. Trop. Afr. l.c.) and Senegal (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 313—*E. balsamifera*, Ait.). Used medicinally, chiefly for horses (Dalziel, Hausa Bot. Voc. p. 54).

Euphorbia Tirucalli, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 556. [*E. media*, N.E. Br. l.c.]

Ill.—Rheede, Hort. Mal. ii. t. 44 ("Tiru Calli"); Rumpf Amb. vii. t. 29 (*Ossifragra lactea*); Blanco, Fl. Filip. t. 210; Berger, Sukk. Euphorbium, p. 20, f. 2; Sim, For. Fl. & For. Res. Port. E. Afr. t. 84, f. 2; Engl. & Drude, Veg. Erde x. p. 251, f. 218; Tropenpfl. xiv. 1910, p. 159; Talbot, For. Fl. Bombay, ii. p. 435, f. 487.

Vernac. names.—Tiru Calli (Malabar, *Rheede*); Tirukalli and various native names (India, *Watt*).—Milk-hedge, Milk-bush.

Believed to be a native of Tropical Africa, where it extends in the East as far southwards as Natal and the Transkei in South Africa; it probably occurs in many other parts of the Continent and although there is no specimen from Nigeria in the Herbarium at Kew mention is made (Dalziel, Bull. Imp. Inst. 1907, p. 263) that "the leafless *Euphorbia Tirucalli* with acid milky juice is found in Kontagora." Naturalized in India—drier tracts of Bengal, the Deccan, South India—and Ceylon.

Similar plants *E. rhipsaloides* Welw. (*E. Tirucalli*, Ficalho) are given in the Flora (l.c.) for Angola and *E. scoparia*, N.E. Br. (*E. Tirucalli*, Schweinf.) for Eritrea and Abyssinia. which for all practical purposes may perhaps be regarded as the same. The Angola plant is called "Almeidina," "Cassoneira" or "Canume-numi"; at Loanda it is "used for making fences and hedges around the quintas and arinos, since it grows rapidly and has numerous virgate, intricate and almost leafless branches" (Hiern, Cat. Welw. Afr. Pl. iv. p. 949).

The use of "Tirucalli" as a hedge plant seems to be common everywhere. In East Africa Speke and Grant met with it and state (specimen in Herb. Kew) "This forms hedges and fences to the villages of Unyamwezi and has been called the Milk-bush, grows into a tree of 20 ft. high when planted singly and makes a dense fence." In India where it is used for this purpose it has been found that cattle apparently understanding the painful nature of the juice will not attempt to break down a hedge of the plant (Watt. *seq.*); often used for hedges, especially in the Deccan (Gamble, Man. Ind. Timb. p. 591).

As to other uses the plant was for many years regarded as of little or no value, except for local purposes. In India mixed with mud the milk is used in N. Arcot in the construction of the flat roofs of houses; in Ganjam it is said to be used to intoxicate and poison crows for which purpose a little of the milk is mixed with boiled rice and fed to the birds; the acrid juice is generally well known as a purgative and counter-irritant (especially in the treatment of animals) and it is very painful when applied to wounds or to the eye (Comm. Prod. India, p. 531).

In Natal it was found about 1910 that rubber of good quality could be extracted from *E. Tirucalli* by a process invented by Dr. Aurel Schultz of Durban and an industry of some importance has since been established there. The latex extracted from the trees is imported in the raw state to England where the rubber is freed from the resinous and other matters mixed with it, then mixed with rubber of better quality used for making tyres for bicycles and motor cars (Kew Bull. 1914, p. 94).

In the prospectus of the company formed (1911) to work the product it was further stated to be in demand for belting, water-proofing, for insulating, making paint, varnish, &c.; the price for the raw product being sold about the same time at 5*d*.–9*d*.

per lb. Latex of *Euphorbia Tirucalli* from Natal (1914) was found to contain 15·7 per cent. of caoutchouc and 82·1 per cent. of resin in the dry material (Col. Rep. Ann. No. 882, 1916, p. 20). The percentage of caoutchouc in the latex is given as only 4 per cent. the remainder being chiefly resinous matter (India Rubber Journ. June 15th, 1912, p. 6).

In 1911 it was reported (Cons. Rep. Ann. No. 4903, 1912, p. 4) " Almeidina " to the amount of 23,390 kilos.—value 2,339 milreis—was shipped from Mossamedes, Angola to Portugal. This product has also been known as " Potato Gum." Euphorbia extract obtained from Southern Nigeria was reported (Col. Rep. Misc. No. 82, 1912, p. 421) on as resembling " Alemeidina " or " Potato Gum," and saleable as such, valued in London (1905) at about 3*d*. per lb. It consisted chiefly of resins (67·6 per cent.) and caoutchouc (23·6 per cent.) the latter of poor quality. A sample of " Egga Gutta " and of " Potato Gutta " received at Kew from the Royal Niger Co. in 1890 probably both belong to this species.

The wood is moderately hard, strong and tough, not attacked by white ants, used for rafters and for making toys in India, (Talbot, For. Fl. Bombay, ii. p. 435). The wood weighs 34 lb. per cubic ft. (Gamble, Man. Ind. Timb. p. 591).

The plant may be readily propagated by strong cuttings and once established would soon become naturalised—otherwise difficult to kill in a suitable climate—hot and comparatively dry. Planted at distances of 15–20 ft.—the tree as before mentioned reaching a height of 20 ft. and upwards—would allow for full development or for fences 2 or 3 ft., approximately, would be sufficient. It is stated that two litres of the latex give a pound of " rubber," and that 5 lb. of " rubber " may be obtained from a tree six years' old (Bull. Bur. Agric. Intellig. Rome, Jan. 1911, p. 135; from " Una valiosa planta de caucho " in El Hacendado Mexicano, Mexico Dec. 1st, 1910). In the hot valleys of Natal the yield is given for a well grown tree at 2*s*. 6*d*. per annum (extract 8*d*. per lb. in London) and tapping is recommended on the half herring-bone system on one quarter of the circumference, twice weekly for healthy well grown trees. Coagulation of the latex is effected in about 24 hours by means of a solution of tannin or a mixture of tannin and hydrochloric acid (Noyes, Agric. Journ. Union S. Afr. v. 1913, p. 706). There is a fine specimen of this plant in the Succulent House at Kew that has to be topped periodically to prevent its growing through the roof.

Ref.—" Almeidina : *Euphorbia Tirucalli*," in Revue des Cult. Coloniales, viii. 1901, p. 347.——" Almeidina or Potato Gum." Diplomatic & Cons. Rep. Ann. No. 3478, 1905, p. 4.——" Report on Euphorbia latex from the Transvaal," Dunstan, in Transvaal Agric. Journ. v. 1907, pp. 528–530.——" *Euphorbia Tirucalli* " in Notizblatt Bot. Gard. Berlin, No. 45, 18th Nov., 1909, pp. 117–118.——" Euphorbia Latices " from Nyasaland, Transvaal,

Natal, Rhodesia, in Col. Rep. Misc. No. 82, 1912, pp. 416–421; "Almeidina from Southern Nigeria, l.c. p. 421.——"The Rubber-Industry in Natal," Noyes (Tech. Adviser to the Tirucalli Rubber Concessions Ltd., and The Reit Valley Tirucalli Rubber Co. Ltd.) in Agric. Journ. Union of South Africa, v. 1913, pp. 706–713.——"*Euphorbia Tirucalli*" in Kew Bull. 1914, p. 94.——"Latex of *Euphorbia Tirucalli*" from Natal and Mauritius, in Bull. Imp. Inst. xiii. 1915, pp. 361–366.——"*Euphorbia Tirucalli*" ("Le Piante Cauccifere della Somalia Italiana Meridionale"), Scassellati Sforzolini, in L'Agric. Coloniale, (Firenze) ix. Sept. 30th, 1915, pp. 522–524.——"*L'Euphorbia Tirucalli*," Scassellati-Sforzolini, in L'Agric. Coloniale (Firenze), x. April 30th, 1916, pp. 161–186, pls. i–xi., May 31st, 1916, pp. 217–234; June 30th, 1916, pp. 284–308, with bibliography at end.

Euphorbia unispina, *N.E. Br.*; Fl. Trop. Afr. VI. Sect. 1, p. 561.

Vernac. names.—Tinya, Tunya or Tinia (Katagum; Kontagora, *Dalziel*).

Katagum, (Dalziel, No. 329, 1908 Herb. Kew) and in Togoland (Kersting).

One of the ingredients in arrow poison with *Strophanthus* (*see* p. 448) (Dalziel l.c. and in Bull. Imp. Inst. 1907, *E. arborescens*, p. 264).

A stout succulent bush up to 10 ft. high with the appearance of a *Cactus;* might be grown as a hedge plant, the same as *Barteri*, *sepium* &c.

BRIDELIA, Willd.

Bridelia atroviridis, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 617.

Vernac. names.—Ogangan, Oviaruzo, (Benin, *Foster*); Asha or Arasha (Yoruba, *Foster*); Ogagan, Asiri (Benin, *Dennett*).

Benin, Abeokuta, Ibadan, Benin &c., in Nigeria and also Gold Coast, Cameroons, Gaboon, Belgian Congo, Angola and Rhodesia.

Timber with dark heartwood, Rhodesia (Swynnerton, Herb. Kew).

A large tree, with straight trunk, smooth bark, Rhodesia at 3800 ft. (Swynnerton l.c. & Trans. Linn. Soc. xl. 1911, p. 190); a tree about 40 ft. Benin (Foster, No. 189, 1908, Herb. Kew); a small tree about 10 ft. high (Fl. Trop. Afr. l.c.).

Bridelia ferruginea, *Benth.*; Fl. Trop. Afr. VI. Sect. 1, p. 619.

[*B. micrantha*, var. *ferruginea*, Müll. Arg.].

Vernac. names.—Kirni or Kirrne (Kontagora, *Dalziel*); Lagos, *Millen*); Ira (Lagos, *MacGregor, Dawodu*); Katasemite (Luganda, *Gowdey*).

Lagos, Nupe, Kontagora, and also widely distributed in Upper and Lower Guinea, the Belgian Congo; the var. *orientalis*, Hutchinson, extending to the French Congo, Nile Land—Uganda, Madi &c. and also in the Belgian Congo.

"The antidote of greatest repute both against local poisons and against those of unknown foes" (Dalziel, Hausa Bot. Voc. p. 62, Bull. Imp. Inst. 1907, p. 265). A food plant of the African Silkworm" (*Anaphe infracta*) in Uganda (Gowdey, Bull. Entomol. Research iii. part 3, Nov. 1912, pp. 269-274).

Bark medicinal, Lagos (Millen, No. 104, Herb. Kew), and a fermented extract is sometimes used for hardening floors (Dalziel, Hausa Bot. Voc. p. 62); leaves used in Agbo (*see* p. 50—a decoction of leaves and roots used in Lagos as a medicine for children) to check and prevent thrush (Dawodu, No. 26, 1901, Herb. Kew).

A shrub or small tree, 10 ft. Nupe (Barter, Herb. Kew), a scrambling shrub, Zungeru (Elliott, No. 6, Herb. Kew), a shrub common in the bush Kontagora (Dalziel No. 51, Herb. Kew). *See* references under *B. micrantha.*

Bridelia micrantha, *Baill.*; Fl. Trop. Afr. VI. Sect. 1, p. 620.

Ill.—Notizbl. Bot. Gart. Berlin, v. Jan. 1913, p. 292; Bull. Agric. Congo Belge, iii. 1912, p. 583, f. 411 (Amenagement d'une plantation, Bukoba), f. 412 (Jeune plantation, Bukoba), p. 587, f. 414 (Plantation ayant été taillés, Bukoba).

Vernac. names.—Ira-Odan (Yoruba, *Foster*); Asa gidi (Epe, *Thompson*); Arasa (Lagos, *Thompson*); Awasa (Yoruba, *Lamborn*; Egira (Sierra Leone, *Scott Elliot*); Nsopa (Zomba, *Purves*); Mushunguna (Chindas, *Swynnerton*); Calutete (Cazengo, *Gossweiler*); Mutserrie or M'Tserrie (Zoutpansberg, Transvaal, *Eastwood, Burtt Davy*); Katasemite (Luganda, *Michel*).

Lagos (Thompson, Nos. 466, 469, 1909; Lamborn, 1911 Herb. Kew); Oban (Talbot, No. 2331, 1912, Herb. Kew), Aboh (Barter, No. 173) and Old Calabar (Holland, No. 111, 1898, Herb. Kew) in Nigeria and widely distributed in Tropical Africa.

A food plant of the "African Wild Silkworm" (*Anaphe infracta*), Uganda (Ann. Rep. Dept. Agric. Uganda, 1910–11; Bull. Imp. Inst. 1913, p. 163; Michel, Bull. Agric. Congo Belge, iii. 1912, p. 582). The production of silk from the Cocoons of *Anaphe* has been undertaken by the African Silk Corporation in the Bukoba District where *Bridelia micrantha* is grown to feed the silkworm; 64 lb. (value £5) of raw cocoons and 720 lb. (value £67) of prepared cocoons being exported in 1910 (Cons. Rep. Ann. No. 5171, 1913, p. 22). In forming a plantation it is recommended to put the plants in 6 ft. apart and when they are large enough to support a colony of silkworms the larvae may be introduced either by tying a cocoon mass on the tree or by placing the eggs on the leaves (Ann. Rep. Dept. Agric. Uganda, l.c.).

The pulp of the wood made by boiling is used for open sores, Sierra Leone (Scott Elliot, Herb. Kew); small black berries

edible; the bark pounded to a fine paste is smeared by the natives over their doors and baskets to stop cracks; timber white and exceedingly durable, makes excellent yokes for oxen, Rhodesia (Swynnerton, Herb. Kew, and Journ. Linn. Soc. xl. 1911, p. 190); wood celebrated for its durability and resistance to termites (Burtt Davy, Kew Bull. 1908, p. 154).

A tree 20–40 ft. high with a dense widely spreading head. A tree about 20 ft. in open grassy laterite plateaux, or a tall tree by river sides and in wet places, Sierra Leone (Scott Elliot, Herb. Kew); a small tree, roadside farms or in Savannah, Gold Coast (Chipp, Herb. Kew); a tree, 20 ft. stems prickly, Gold Coast (Johnson, Herb. Kew); a small to medium sized tree 30–40 ft. Rhodesia (Swynnerton, l.c.); a middlesized tree, branches covered with short thorns, Batanga (Bates, Herb. Kew) a small tree, Aboh (Barter, Herb. Kew); a small dry zone tree, Yoruba (Foster, Nig. Trees & Pl. p. 61).

Ref.—"On the Utilisation of an Indigenous African Silkworm (*Anaphe infracta* in Uganda," Gowdey, Bull. Entomological Research, iii. part 3, pp. 227–342, Nov. 1912, pp. 269–274—covering cultivation of the trees pp. 271–273.——"Vers à Soie Sauvages d'Afrique," Michel, in Bull. Agric. du Congo Belge, iii. 1912, pp. 581–588.——"*Bridelia micrantha*, Eine Futterpflanze für Afrikanische Seidenraupen," Engler, in Notizblatt Bot. Gart. Berlin, v. Jan. 1913, pp. 291–293.——"African Wild Silk," in Bull. Imp. Inst. xiii. 1915, pp. 105–110; xiv. 1916, pp. 167–180.

Bridelia scleroneura, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 614.

Nupe, Onitsha (Barter), Yola (Shaw, Dalziel), Lokoja.

Roots used in medicine, Yola (Shaw, No. 61, Herb. Kew).

A tree up to 40 ft. high.

Oldfieldia, Benth.

Oldfieldia africana, *Benth.* & *Hook.*; Fl. Trop. Afr. VI. Sect. 1, p. 625.

Ill.—Hook. Kew Journ. Bot. ii. (1850) t. 6; Laslett, Timber & Timber Trees, f. 27 (log as put upon the market).

Vernac. names.—Tortoza, Pulai Pawi (Sierra Leone, *Unwin*)—African Oak or Teak.

Sierra Leone (Oldfield, Mann, Welwitsch, Kirk, Vogel, Unwin & Smythe, Herb. Kew); Ivory Coast (Chevalier, No. 16250, Herb. Kew). There appears to be no record supported by specimens of this tree occurring in Nigeria. Thompson (List For. Trees, S. Nig. 1910, p. 9) states that it is "common in Sierra Leone, very rare in S. Nigeria."

Wood used for all strong work and one of the best, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 35). Used for boat-building, S. Nigeria (Thompson, l.c.). African Oak or Teak was formerly imported into this country from Sierra Leone—where in 1853, Welwitsch reported vast forests on the North

side of the Colony—for ship-building; but is practically unknown in commerce at the present day (Kew Bull. 1913, p. 82).

An interesting note in reference to the use for ship-building, &c. is given in the Kew Journal of Botany (Hooker, ii. 1850, pp. 185–186).—" It was about the year 1819 that the value of African Oak or Teak was first experienced in the British Navy and it has proved of the highest importance for certain parts of a vessel. The "Nimrod," a 28-gun ship is built of it but the weight of the wood is much against it as a material exclusively, and, of late, its use has been confined to beams, keelsons, waterways, shelf-pieces, and framing of bitts, &c.; so that in the opinion of many, for such purposes no timber is comparable to it except the "Sabicu" (*Acacia formosa*, H. B. K.) [= *Lysiloma Sabicu*] from Cuba.'

The wood is very heavy, a specimen in the Kew Museum, presented by the Admiralty in 1855 is over 60 lb. per cubic ft. and sinks in water, the exact weight of the specimen is given as 64 lb. 13 oz. 8 drs.

Ref.—" African Oak or Teak," in Timber & Timber Trees, Laslett, pp. 299–303 (Macmillan & Co. London, 1894).——" African Oak, *Oldfieldia africana*," in Timbers of Commerce, Stone, pp. 195–196 (Wm. Rider & Son, Ltd. London, 1904).

UAPACA, Baill.

Uapaca guineensis, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 640.

Ill.—Hook. Ic. Pl. t. 1287.

Vernac. names.—Ajebe (Yoruba, Benin, *Farquhar*); Kafafogo (Sokoto, *Dalziel*); Fle (Bonny, *Barter*); Omukusu (Uganda, *Dawe*); Kundi (Sierra Leone, *Smythe & Unwin*); Nkpana (Uwet, Calabar River, *MacLeod*); Ile (Ibo, *Thompson*).

Upper Guinea—Sierra Leone to the Cross River, Nigeria; Upper Ubangi and Uganda.

Fruit edible, resembling a medlar in flavour, Nupe (Barter, No. 1693, Herb. Kew); a valuable timber tree, Uganda at 4000 ft. (Dawe, No. 957, Herb. Kew); timber good for beams, Uwet (Macleod, Herb. Kew); the fruit sometimes an ingredient in arrow poison (Dalziel, Hausa Bot. Voc. p. 53).

A tree 40–60 ft. high in moist ravines where it generally makes large aerial roots up the stem something like the mangrove, Nupe (Barter, l.c.), up to 40 ft. or more in swampy forests, Buddu, Uganda (Dawe, Herb. Kew); large forest tree, stem supported on numerous aerial roots, Lagos (Moloney, Herb. Kew).

Uapaca Heudelotii, *Baill.*; Fl. Trop. Afr. VI. Sect. 1, p. 639.

Vernac. name.—Yeye (Lagos, *Foster*); Ile (Bonny, *Moloney, Barter*).

Upper Guinea—Senegambia to the Cameroons.

Fruit has a pleasant flavour somewhat resembling that of a medlar (Barter, Mus. Kew).

A tree up to 60 ft. high.

Uapaca Staudtii, *Pax.* Fl. Trop. Afr. VI. Sect. 1, p. 638.

Vernac. names.—Akun (Yoruba, *Thompson, Sankey*); Bosambi (Cameroons, *Jentsch*).

Oni, Southern Province, Nigeria (Sankey, No. 14, 1916, Herb. Kew) and in the Cameroons.

Wood, hard, red (l.c.); even-grained, easily worked, planes and saws well, a good general purpose timber and very durable (List, Empire Timb. Exhib. London, 1920, p. 274). The output (73,032 cubic ft.) of sinking timber reported in 1919 included this species and "Ekki" (*Lophira*), chiefly (Thompson, Ann. Rep. For. Adm. Nigeria, for 1919, S. Prov. p. 10).

A tree 35–90 ft. high, with Mangrove-like roots; found in swamps and on banks of creeks (Sankey, l.c.) and in the Rain Forests of Nigeria (Empire Timb. Exhib. l.c.).

Ref.—"Bosambi-*Uapaca Staudtii*," in "Der Urwald Cameroons" (Tropenpflanzer, xii. Beihefte), Jentsch, March, 1911, pp. 160–161.

Phyllanthus, Linn.

Phyllanthus amarus, *Sch. & Thonn.*; Fl. Trop. Afr. VI. Sect. 1, p. 717.

Vernac. name.—Dobisowo (Lagos, *Dawodu*).

Lagos, Old Calabar, &c. in Nigeria; Gold Coast, Liberia, Togoland, Ivory Coast in West Africa and extending to the Mozambique district on the East.

Whole plant included in Agbo (*see* p. 50), Lagos (Dawodu, Herb. Kew).

A small plant about 1 ft. high; a sandbinder Axim (Chipp, Herb. Kew).

Phyllanthus discoideus, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 707.

Vernac. names.—Opepiah (Gold Coast, *Brent*); Sagga (Sierra Leone, *Mann*); Mutete, Caretete or Caletete (Golungo Alto, *Welwitsch*).

Nupe, Lagos, and widely distributed in Tropical Africa.

Wood hard, used for shingles, Gold Coast (Brent, No. 408, 1913, Herb. Kew); wood white; excellent; Golungo Alto (Hiern, Cat. Welw. Afr. Pl. i. p. 961).

A tree 30–50 ft. high; Gossweiler—(on specimens Nos. 4579. 4692 & 4677—Cazenzo, in Herb. Kew) gives 7 metres high and rarely more than 30 cm. in diam. deciduous just before flowering, a deciduous tree 60 ft. high branched from the base and a deciduous tree 15 metres high, $\frac{1}{2}$ metre in diam. wood red brown. A tree 30 ft. Nupe (Barter, Herb. Kew), circumference 7 ft. River Bagroo (Mann, Mus. Kew).

Phyllanthus floribundus, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 701.

Vernac. names.—Arunyeran (Lagos, *MacGregor*); Majiriyar Kurumi (Hausa, Kano, &c. *Dalziel*).

Lagos, Nupe, Zungeru in Nigeria and widely distributed in Upper Guinea—Senegambia to the Cameroons, and extending to the Mozambique region on the East.

Used to relieve pain in the eyes, Lagos (MacGregor, No. 159, Herb. Kew).

A trailing thorny shrub or climber up to 30 ft. high.

Phyllanthus Niruri, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 731.

Ill.—Rheede, Hort. Mal. x. t. 15 ("Kirgandi"); Rumpf. Amb. vi. t. 17; Martyn, Hist. Pl. Rar. t. 8; Burman, Thes. Zeyl. t. 93, f. 2 (*Urinaria indica*); Wight, Ic. Pl. Ind. Or. v. t. 1894 (*P. Nirure*); Bettfreund, Fl. Argent. ii. t. 84.

Vernac. names.—Aijlaun-mahaij (Java, *Filet*); Herbe au chagrin (Mauritius, Seychelles, *Gerth van Wijk*); Erva poubinha, Yerba de quinino (Spanish, *Amadeo* in Merck, Ann. Rep. Jan. 1893, p. 103).

"The decoction of the root and leaves is very bitter and is a favourite remedy among the natives of Porto Rico for the cure of intermittent fevers." "The infusion of the root and leaves is a good tonic and a diuretic, when taken cold in repeated doses" (Pharm. Journ. [3] xviii. April 28th, 1888, p. 906—"The Botany and Veg. Mat. Med. of the Island of Porto Rico," by Dr. Amadeo).

Nupe—a weed in cultivated ground (Barter) and a common weed in the Tropics; small plant found along roads, particularly during the rainy season, Porto Rico (Amadeo, l.c.).

Phyllanthus pentandrus, *Schum.*; Fl. Trop. Afr. VI. Sect. 1, p. 710.

Vernac. names.—Ehin olobe (Lagos, *Dawodu*); Geron Tsuntsaye (Hausa, *Dalziel*).

Lagos, Nupe, Lokoja, Katagum, in Nigeria and widely distributed in Tropical Africa; also in South Africa.

Used medicinally in Lagos (Dawodu, Herb. and Mus. Kew). Fruit eaten by birds (Dalziel, Hausa Bot. Voc. p. 38).

A small annual plant about 18 in. high, found as an elegantly-growing shrubby plant with minute axillary flowers that mature quickly, gravel walks, Lokoja (Parsons, Herb. Kew), in sand on railway track, flowers white, Victoria Falls (Kolbe, Herb. Kew), in hot sandy places in short grass, Loanda (Hiern, Cat. Welw. Afr. Pl. i. p. 957).

Phyllanthus reticulatus, *Poir.*; Fl. Trop. Afr. VI. Sect. 1, p. 700.

Ill.—Lodd. Bot. Cab. t. 116; Wight Ic. t. 1899 (*Anisonema multiflorum*); Jussieu, Euph. t. 4, f. 11 (*Anisonema reticulatum*); Talbot, For. Fl. Bombay, ii. p. 440, f. 490.

Vernac. name.—Tsah (Katagum, *Dalziel*).

Lagos, Katagum, Yola, Bornu, in Nigeria and widely spread over Tropical Africa.

Stems used for making native beds, Katagum (Dalziel, Herb. Kew).

A slender shrub on river banks and sand flats.

Fluggea, Willd.

Fluggea microcarpa, *Blume*; Fl. Trop. Afr. VI. Sect. 1, p. 736.

Ill.—Talbot, For. Fl. Bombay, ii. p. 455, f. 497.

Vernac. names.—Tigwi (Sierra Leone, *Unwin*); Umsosoti (Chindao, *Swynnerton*).

Lagos, Nupe, Katagum, throughout Tropical Africa and occurring in India, Burma, China, Australia, &c.

Astringent bark used for poisoning fish; Wood reddish-yellow, close-grained, strong and durable; used for Agricultural Implements, India (Talbot, l.c.)

Fruits edible (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 193).

A shrub or small tree about 12 ft. high.

Microdesmis, Planch.

Microdesmis puberula, *Hook.*; Fl. Trop. Afr. VI. Sect. 1, p. 741.

Ill.—Hook. Fl. Nigrit. t. 26; Hook. Ic. Pl. t. 758.

Vernac. names.—Arinigo (Yoruba, *Millson, Moloney*); Ineyinfun (Lagos, *Millen*); Offenmah (Ashanti, *Chipp*); Aforwah (Wasaw, Gold Coast, *Brent*); Erapata (S. Nigeria, *Dennett*); Nkpili (Onitsha, *Unwin*).

Lagos, Onitsha, Adiabo (Old Calabar) and in other parts of Upper Guinea from Senegambia to Fernando Po.

Leaves when boiled used for feeding babies and said to cure them of spleen, Lagos (Moloney, Herb. Kew). Wood used for hoe handles and chew sticks, Ashanti (Chipp. No. 102, 1912, Herb. Kew); for chewsticks, Lagos (Millen, Herb. Kew). Thompson (List, For. Trees, S. Nig. 1910, p. 9) mentions a wood called "Ubellu" (Benin) used at Calabar as a timber by the Public Works Department. It is attributed to a species of *Microdesmis*, and it may be this one as the only other species (*M. Zenkeri*, Pax) so far appears to have been collected only in the Cameroons and further South. There is no specimen in the Kew Herbarium associated with the name "Ubellu."

A bush or shrub about 10 ft. high. A small tree, Ashanti (Chipp, l.c.) a sub-shrub, 1 ft., Aquapim Hills, Gold Coast (Johnson, No. 589, Herb. Kew); a small shrub Onitsha (Barter, No. 1805, Herb. Kew).

HEVEA, Aubl.

Hevea brasiliensis, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 743.

Ill.—Lam. Encycl. t. 790 (*Siphonia*); Jussieu, Euph. t. 12, f. 38B (*Siphonia brasiliensis*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 141 (*Siphonia elastica*); Woodville, Med. Bot. iv. (1832) t. 224 (*Siphonia elastica*); Hayne, Darst. Beschr. Gewächse, xiv. t. 5 (*Siphonia brasiliensis*); Collins, Caoutch. t. 1; Hook. Ic. Pl. t. 2573, ff. 1–7; Köhler, Med. Pflan. iii; Zippel, Ausl. Handels Nährpfl. t. 36 (*Siphonia elastica*); Tropenpfl. 1898, p. 271; Arb. Amazon (1900) tt. 4–5 ("Seringueira"); Preuss, Expedit. Cent. und Südamer. p. 26 (in Bot. Gart. Port of Spain); Tropenpfl. Beih. 1905, pp. 7 & 23 (habit); Bull. Econ. Indo. Chine, 1905, pp. 690 (inflor.), 691 & 693 (fr. & seeds); Yves Henry, Caoutchouc Afr. Occid. Franç. p. 197, f. 6 (Rameau fruct. d'Hevea fr. coupé); Arb. Amazon (1906) t. 33, f. 2; Bull. Agric. Congo Belge, i. 1910, p. 253 (trees 2½ years old), Brown, Rubber, t. 2; Harrison & Stockdale, Rubber & Balata, B. Guiana, ff. 1–9.

Vernac. names.—Seringueira branca, Seringueira preta (Brazil. *Huber, Prain*).—Para Rubber; Elastic Resin Tree (Woodville).

Native of Brazil. Cultivated in Nigeria, including the Cameroons and other parts of Tropical Africa; in Ceylon, Malaya, Dutch East Indies, West Indies, Mauritius, Seychelles, &c.

The product of this tree so well known as "Para Rubber" has probably no equal in trade for the magnitude of its development from apparently small beginnings; the story has been so often told that it is not proposed to repeat it here, the main facts are recalled by mention of the names of the earlier workers Markham (India Office), Hooker, Thiselton-Dyer (Kew), Thwaites, Trimen (Ceylon), Cantley, Murton, Low, Ridley (Malay Peninsula); Wickham, Cross (Collectors), recorded on a silver plate (now in the Para Rubber Case, Kew Museum No. 1) presented to the Royal Botanic Gardens, July 7th, 1911, by The Rubber Growers' Association at the International Rubber Exhibition in London 1911. The Kew Report for 1876, records the arrival of the receipt at Kew June 14th of the first collection of seeds from Brazil and the subsequent despatch to Ceylon of about 2000 plants raised from these seeds. Samples of Ceylon-grown rubber were submitted to Kew as early as 1882: but, the first sample of rubber (now in the Museum at Kew) giving a satisfactory indication of the commercial prospects under cultivation was sent by Dr. Trimen from Ceylon to Kew in 1892, valued in Mincing Lane (Feb. 1893) at from 2*s*. 3*d*.–2*s*. 6*d*. per lb. (*see* Kew Bull. 1893, p. 159), and plantation rubber, according to statistics first began to appear in marketable quantities in 1903 from Ceylon although exports on a smaller scale from this Colony were made in 1901 (l.c. 1906, p. 241). The Straits Settlements about the same time (1903) began to gain in importance,

until at the present time (1919)—and for several years before—it is together with the Federated Malay States the greatest centre of production under cultivation, the imports into the United Kingdom exceeding by more than £7,000,000 worth (1915) the imports from Brazil.

In Nigeria official records show that plants were sent out from Kew to Lagos at various times beginning in 1887 and beginning 1898 to Old Calabar—where in 1900 the writer put out in permanent places 20 plants of this species. In 1908 the Report on the Garden stated that the largest tree in the garden hollow (a low-lying piece of ground where some of the earlier Kew plants were established) produced 103 seeds of which 81 were germinated. Eight of these trees are probably referred to in the reference to tapping experiments at Old Calabar: "Forty-five trees, eight of which were estimated to be fourteen years old" were tapped in 1910; yielding 31·18 oz. of dry rubber in all from the eight trees. Briefly for the whole of the Southern Provinces—In 1901 the Rev. J. E. Wright started a small plantation at Orugob, Jebu (S. Nig. Govt. Gaz. July 28th, 1909, Suppl. p. 3); in 1905 planting began at Onitsha (*see* p. 37); in 1912 the Agricultural Department had two small plantations of about 3000 trees each of a tappable age, one at Agege and the other at Calabar, and tapping experiments were being made on Messrs. Millers' Plantation at Sapele (Ann. Rep. Agric. Dept. S. Nigeria, 1912, p. 3) where in 1909 this firm alone had 70,000 plants in, from 1–4 years old (S. Nig. Govt. Gaz. Oct. 13th 1909, Suppl. p. 5). The Director of Agriculture in 1917 reports (Ann. Rep. Agric. Dept. S. Prov. Nig.) that the African Association's Plantation at Ikotombo, Calabar River had made excellent progress since his visit in 1912. It comprised 500 acres with 54,000 trees from 2–6 years of age, about 40,000 large enough to tap, and that several large plantations near Aba had reached the productive stage. In 1918 it is reported "The Para Rubber tree appears to be quite acclimatised in many parts and its rate of growth compares favourably with that recorded on Para Rubber plantations in the East. The quantity and quality of the rubber yielded by this tree are also very satisfactory" (Nigeria Gaz. Trade Suppl. Oct. 31st, 1918, p. 104). The native farmers it is satisfactory to note appear to have been no less successful than the various establishments of the Department of Agriculture, and the Plantations under European control.

The market descriptions of Para Rubber are "Para" or "Fine Para" (native Brazilian) and "Sheet," "Smoked Sheet," "Biscuits," "Crepe," "Pale crepe," "Block," &c. all "Plantation Hevea"; value at the present time (Aug. 1919) for "Para" 2*s*. 3*d*.–2*s*. 6*d*. and for "Crepe" 1*s*. 11*d*.–2*s*. 0½*d*. and "Smoked Sheet" 1*s*. 10*d*.–2*s*. 0½*d*. per lb. In 1913 the price was from about 3*s*. 9*d*.–4*s*. 6*d*.

Propagated from seed which it is advisable should be specially selected from the best trees, sown as soon as possible

—say, within a week—after collection as they soon lose their vitality—2 or 3 weeks—[although packed carefully in charcoal or slightly damped incinerator earth they carry long distances; of 100 seeds despatched from Singapore July 6th to Old Calabar (arriving Sept. 20th) in 1906, 90 per cent. germinated (Kew Bull. 1906, p. 196)]. They germinate in a few days and plants should be ready for transplanting when about 2 ft. or so high, or sometimes allowed to grow to 6 ft. or more, when they are topped and trimmed to the so-called "stumps." "Para stumps" have been advertised for sale when two years old; but in general it should be possible to raise the plants for putting into permanent places, within 6–9 months. Propagation may also be effected by cuttings, and planting seed at stake is sometimes practised. Experiments with budding and grafting have been made in Malaya and Java with some success and trials are being made in Ceylon (Trop. Agric. Nov. 1919, pp. 297–298; Kew Bull. 1920, pp. 113–119). The distance apart in the plantation may be 10 × 10 ft.; or 15 × 15 ft. so that on thinning out the final distance apart may be from 20–30 ft. It is, however, open to question whether it is not more advisable to plant out 20–30 ft. at the outset; the wider planting encourages healthier and stronger growth and the only advantage in close planting appears to be a comparatively small return from the early tapping of trees that must be marked for removal in time to prevent overcrowding. The inter-planting of suitable catch-crops, such as "Robusta Coffee" (*see* p. 367), "Capsicums" (p. 489), "Pine Apple," "Lemon Grass," Bananas, &c., might just as readily bring in as good an income and do more towards keeping the ground in good tilth for the main crop of rubber.

Tapping commences at from 4–7 years of age when the trees should be not less than 6–8 in. in diameter at from 3–6 ft. from the ground; 5 ft. from the base of the trunk being usually the limit allowed for tapping. The methods in vogue from time to time have varied from the V-shaped cut, under which system some of the earlier Ceylon trees were tapped (*see* Kew Bull. 1898, p. 260: Add. Ser. vii. p. 95)—an improved modification of the native Amazon method—spiral, herring-bone and vertical incisions, all of which now appear to be becoming obsolete, excepting a basal V and a modified herring-bone system, that is with lateral incisions 12–18 in. apart on one side of the vertical line only, usually the left at an angle of about 45°; one-quarter or one-third only being taken in hand at one time, the tappings being calculated to cover the section in one to two years and the circumference in four to six years, when the bark on the first section tapped is sufficiently renewed to admit of a repetition of the process. The proportionate value of one or more tapping lines at each operation has not yet been determined; but there appears to be a strong tendency at the present time to regulate the tappings in order to cover the regulation area of trunk in eight years. The tapping tools are various in make and the same remarks may be more or less applied here as given under

Funtumia elastica (*see* p. 457) more perhaps depending on the skill and care of the workmen, who as a rule prefer as simple a knife as possible.

In the collection of the latex, coco-nut, tin, iron, steel, aluminium, enamelled iron, glass and earthenware cups have been used, the first obsolete and the four latter most in favour, with a preference perhaps for glass and smooth earthenware. It is essential to have cups that can be easily cleaned. For the same reason the pails for carrying the latex to the factory should be of some suitable manufacture, the kerosene tin often used on account of its cheapness has given way to the round galvanised milk pail now commonly used.

Coagulation may be effected by various acids (*see* p. 457)—hydrofluoric (purub), acetic acid being perhaps most commonly used and some attempts are being made to coagulate the latex with specially designed machinery on the native Brazilian method, of submitting it to the smoke of burning nuts. On coagulation it is prepared as speedily as possible in the forms referred to above, " biscuits " and " crepe " being the most in favour, the former by hand and the latter by machinery. It is important that in whatever form shipment is made the rubber should be throughly dry. Smoke-drying instead of air-drying is sometimes resorted to, the fuel being mangrove wood, coco-nut husks, or other convenient material. The seeds yield approximately 40 per cent. of oil suggested as a substitute for Linseed Oil and for use in the manufacture of paints and of soft soap (*see* Col. Rep. Misc. No. 88, 1914, pp. 450–457).

The above details are necessarily very brief, the subject being, like cotton, indigo, &c., one for the expert and in view of the extensive literature including many excellent text-books, readily accessible, little more than references need be given, of which the following is confined to books and special bulletins.

Ref.—" Para Rubber in Ceylon," Kew Bull. 1893, p. 159.——" Para Rubber (*Hevea brasiliensis*)," l.c. 1898, pp. 241–277. ——" Para Rubber in the Straits Settlements," l.c. 1899, pp. 21, 22.——" Export of Para Rubber Seeds," l.c. 1906, pp. 196–197.——" The Rise and Fall of Prices of the Forest Product for 30 years and Cultivated for 4 years," l.c. 1906, pp. 241–242 : reprinted in Add. Series vii. 1906, pp. 75–117.——" The Cultivation and Preparation of Para Rubber," Johnson, pp. 1–178 (Crosby Lockwood & Son, London, 1904, 2nd ed. 1909).——*Hevea brasiliensis* or Para Rubber : Its Botany Chemistry and Diseases, Wright, pp. 1–530 (A. M. & J. Ferguson, Colombo, 1906, 4th ed. Maclaren & Sons Ltd. London, 1912).——Rubber in the East : Official Account of the Ceylon Rubber Exhibition. Peradeniya, Sept. 1906, Willis, Bamber & Denham, pp. 1–265 (Govt. Printer, Colombo, 1906).——On the Plantation, Cultivation and Curing of Para Indian Rubber, Wickham, pp. 1–78 illustrated (Trübner & Co. Ltd. London, 1908).——Para Rubber in the Malay Peninsula, Asimont, pp. 1–64 (L. Upcott Gill

London, 1910?).——A Lecture on the Para Rubber Tree, Gallagher, Dept. Agric. Fed. Malay States, Bull. No. 10, 1910, pp. 1–27.——The Cultivation of Hevea: A Manual for the Planter, Cramer, (transl. Cope & Content, from the Dutch) pp. 1–132 (J. H. De Bussy, Amsterdam, 1911).——The Whole Art of Rubber Growing, Wicherley, pp. 18–46 (The West Strand Publishing Co. Ltd., London, 1911).——The Rubber-Planter's Note Book, Braham, pp. 1–108 (Crosby Lockwood & Son, London, 1911).——The Rubber Country of the Amazon, Pearson, pp. 1–250, illustrated (The India Rubber Publishing Co. New York, 1912).——Rubber and Rubber Planting, Lock, pp. 1–245; illustrated (Cambridge University Press, 1913).——The Preparation of Plantation Rubber: A Reference Text-Book for Practical Planters, Morgan, pp. 1–269, illustrated (The Rubber Growers' Association, London, 1913).——"Para Rubber," Kew Bull. 1913, pp. 226–229—red, white and black varieties.——The Rubber Tree Book, De Bois Maclaren, pp. 1–300 (Maclaren & Sons, Ltd. London, 1913).——The Amazon Valley or the Home of the Rubber, Rodigues Viera, pp. 1–24 (Watts & Co. London, 1914)——The Introduction of Para Rubber to Buitenzorg, Kew Bull. 1914, pp. 162–165.——"The Para Rubber Tree," in Rubber, Its Sources, Cultivation and Preparation, Brown, pp. 101–136 (John Murray, Albemarle St., London, 1914).——The Tapping of the Para Rubber Tree: Some Physiological Experiments, Bateson, Dept. Agric. Fed. Malay States, 1914, pp. 1–54, plates i.–viii.——"Para Rubber Seed-Oil and Cake," Col. Rep. Misc. No. 88, 1914, pp. 450–457.——"Wild Rubber and Selection," Kew Bull. 1915, pp. 183–184, from Dr. P. J. S. Cramer in Inter. Rubber Congres Met. Tent. Batavia, 1914, Rubber recueil.——The Rubber Industry of the Amazon and How Its Supremacy can be Maintained, Woodroffe & Hamel Smith, pp. 1–435, illustrated ("Tropical Life" Publishing Dept. London, 1915).——Notes on the Tapping of Para Rubber, Freeman, pp. 1–10 (Reprint from Bull. Dept. Agric. Trinidad, xv. 1916, part 5).——The Preparation of Plantation Rubber, pp. 1–60 (The Rubber Growers' Association, London, 1917).——"Seed Selection in the Cultivation of *Hevea brasiliensis*," Kew Bull. 1917, pp. 19–24; pp. 118–120.——The Significance of Diseases in the Economy of Malayan Rubber Plantations, l.c. pp. 225–229.——"Para Rubber Seed as a Source of Oil and Feeding-Cake," Bull. Imp. Inst. xvii. Oct.–Dec. 1919, pp. 543–571.——The Preparation and Vulcanisation of Plantation Para Rubber, Eaton, Dept. of Agric. Fed. Malay States, Bull. No. 27, Kuala Lumpur, 1918, pp. 1–398.——"Para Rubber in Nigeria" in Trade Suppl. to the Nigeria Gazette, Oct. 31st, 1918, pp. 104–105.——"Variation in *Hevea brasiliensis*," Kew Bull. 1919, pp. 317–318.——"On the Selection of *Hevea brasiliensis*," l.c. 1920, pp. 113–119.——Various Bulletins, Dept. of Agric. Ceylon. ——Numerous Papers in "The India Rubber Journal" (Maclaren & Sons, Ltd. London) and "The India Rubber World" (The India Rubber Publishing Co. New York.)

RICINODENDRON, Müll. Arg.

Ricinodendron africanum, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 745.

Ill.—Hook, Ic. Pl. t. 1300; Engl. & Prantl, Pflan. iii. pt. 5, f. 54 c–d; Ann. Inst. Col. Marseille, 1898, p. 42, f. 9 (seeds, *R. Heudelotii*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 71 (*Barrettia umbrosa*); Engl. & Drude, Veg. Erde, ix. p. 700, f. 599 (*R. Heudelotii*); Pax, in Engl. Pflanzenr. iv. Euphorb.—Cluytieae, p. 47, f. 16, p. 48, f. 17 E (*R. Heudelotii*).

Vernac. names.—[Erimado (Yoruba) Okwen (Benin) *Foster*], Ookwe (Benin, *Unwin*); [Nsasana (S. Nigeria); Okwen (Benin); Erimado or Erinmado (Yoruba); Asoma (Gold Coast, Owama or Awama (Gold Coast); *Thompson*]; Awomah (Gold Coast, *Brent*); Okao Koodo (Gold Coast, *Johnson*); Asoma (Gold Coast, *Armitage*); Kishongo or Kisongo (Uganda, *Dawe*); Issanguila (Gaboon, *Klaine*); Munguella (Cazengo, *Gossweiler, Welwitsch*); Engessang or Essang (Gaboon, *Heckel*).

Old Calabar (Williams, No. 6, Herb. Kew); Oban (Talbot, No. 2333, Herb. Kew); Benin (Unwin, No. 43) and Lagos (Schlechter, Herb. Kew) in Nigeria; found also in Sierra Leone, Gold Coast, Cameroons, Gaboon, Uganda and East Africa.

Seeds yield an oil which could be utilised as a substitute for "Tung Oil" (Col. Rep. Ann. No. 583, 1908 (for 1907), S. Nigeria, p. 37) and also found by a firm of varnish makers to be intermediate between "Tung Oil" (*Aleurites Fordii, cordata*) and "Linseed" (*Linum usitatissimum*). Superior to the latter for certain purposes. A consignment of one ton of kernels for trial on a commercial scale was suggested in 1908, the price anticipated being £10, c.i.f. in London (Col. Rep. Ann. No. 630, 1909 (for 1908) S. Nigeria, p. 39; *see also* "Results of the Examination of "Okwen" Seeds, *Ricinodendron Heudelotii*," in Govt. Gaz. S. Nig. Mar. 3rd, 1909, Suppl. p. 7). It may be mentioned that "Tung" or "Wood oil" kernels are rarely imported and in 1909 the oil was quoted at from 25*s*. 6*d*.–26*s*. per cwt. spot and for arrival 27*s*. 3*d*. c.i.f. (Chem. & Druggist, May 22nd, 1909, p. 808) and in 1913 oil of "Hankow description" was being sold in Hamburg at m. $60\frac{3}{4}$ c.i.f. (l.c. June 28th, 1913, p. 980).

The natives of the Semliki and Unyoro forests of Uganda eat the seeds after boiling (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 56).

Wood used by the natives above mentioned for making doors of their huts (Dawe, l.c.) for the same purpose and for making bowls to hold the dyes for dyeing native cloth in Southern Nigeria (Thompson, List For. Trees, S. Nig. 1910, p. 9) where it is also much used by the native as a fuel wood (Foster, Nig. Trees & Pl. p. 60); used for carving musical string instruments in Cazengo, Angola (Gossweiler, Herb. Kew), for making stools and tom-toms, Aburi, Gold Coast (Johnson, Herb. & Mus. Kew). Suggested because of its lightness—12 lb. per cubic ft.

for floats for rafting logs heavier than water (Bull. Imp. Inst. 1908, p. 236).

A specimen in the Kew Museum from Gold Coast (Johnson, 1900), has specific gravity 0·217 = 13·5 lb. per cubic ft., and one from Uganda (Dawe, No. 637, 1907) sp. gr. 0·23 = 14·5 lb. per cubic ft. These woods at the time of receipt had been examined and found to be lighter than cork (15 lb.), described as useless for turning, and the only use that could be suggested being that for floats above mentioned.

A tree generally about 30–70 ft. sometimes more high; 20 metres high, 30–60 cm. diam. Gaboon (Klaine, Herb. Kew). The dimensions of two trees Mamu Reserve, said to be 12 years old were given as (1) height 83 ft. girth 63 in. (2) height 60 ft. girth 61 in.; the mean annual girth increment about 5 in. (Thompson, Rep. Mamu Reserve (1911) p. 4), growing on a gambari farm and along both sides of the main road (l.c.); most prolific and large quantities of seed are available if a demand springs up for them; common in the mixed evergreen and deciduous forests of the intermediate zone (Thompson, Col. Rep. Misc. No. 66, 1910, p. 90). The natives of the Ivory Coast preserve the trees found growing in the neighbourhood of villages (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 314).

Ref.—" Huile d'Engessang ou d'Essang du Gaboon " Heckel, in Ann. l'Inst. Col. Marseille v. 2nd fasc. 1898, pp. 40–49.——" Nsa-Nsana Seeds from S. Nigeria," Bull. Imp. Inst. v. 1907, pp. 369–370.——" *Ricinodendron Heudelotii* (*R. africanum*) Seeds," l.c. vi. 1908, pp. 367–369, with analysis.——" Report by the Imperial Institute on Okwen Seeds," in Govt. Gaz. S. Nigeria, March 3rd, 1909, Suppl. p. 7.

CROTON, Linn.

Croton amabilis, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 757.

Vernac. names.—Ajeofole (Ebute Metta, *Millen*); Ajekofole (Lagos, *Punch*); Itchen Masar (Hausa, *Dalziel*).

Lagos (Foster No. 33, Herb. Kew); Kontagora (Dalziel, No. 281, Herb. Kew), Oban, Okuni, Ilorin, Abeokuta in Nigeria and also known from Sierra Leone.

A soup made of the dry leaves good for dysentery, Lagos (Punch) " used in medicine, for witch " Ebute Metta (Millen), reputed to be of great efficacy against witchcraft, Sierra Leone (Daniell).

Wood used for rafters, for which the tree is " cultivated about the Yoruba towns, when wood is scarce " (Barter).

A low tree, common in streets, Abeokuta (Irving); a tree 20–30 ft. in Native compound, Okuni, Cross River (Holland), tree, 20 ft. Ebute Metta (Millen), a shrub-like tree, Lagos (Punch), a tree cultivated in the gardens of Sierra Leone, common, flowers in May and June, Sierra Leone (Daniell). All the above notes

are from specimens in the Herbarium at Kew. Dalziel (Hausa Bot. Voc. p. 49) mentions "itchen masar" as a shrub sometimes planted in Native compounds and Foster (Nig. Trees & Pl. p. 61) gives "Ajekofole," a shrub about 10–15 ft. occasionally cultivated in villages for medicinal purposes in Yoruba. Both of these are referred to *C. zambesiacus*, but this plant appears to be known, so far, only from Lower Guinea, Mozambique District and the Belgian Congo.

Croton lobatus, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 750.

Ill.—Pal. de Beauv. Fl. Oware & Benin, i. t. 36.

Vernac. name.—Eru (Lagos, *Macgregor*, *Dawodu*, *Millen*, *Dennett*).

Lagos, Nupe, Katagum, Lokoja, and widely distributed in Upper Guinea, the Shari and Nile regions.

Used for sores, Lagos (MacGregor & Dawodu, Herb. Kew).

An erect annual 2–3 ft., a weed 2 ft. chiefly in Dawa (*Sorghum*) fields, Nupe (Barter, Herb. Kew): a weed—erect, 2–3 ft. of fields, amongst shrubs and tall grass, Katagum (Dalziel, Herb. Kew).

Croton Tiglium, *Linn.* Sp. Pl. (1753) p. 1004.

A shrub or small tree 15–20 ft. high. Leaves alternate ovate, slightly serrate, apex attenuate, bright green above, paler below, veins prominent below about 4 in. long and 2 in. wide. Inflorescence a terminal raceme, unisexual; male flowers nearer the growing point, female flowers nearer the base of the spike. Fruit, 3 celled, each cell with one seed—ovoid, about ½ in. long, slightly less wide.

Ill.—Rheede, Hort. Mal. ii. t. 33; Rumpf. Amb. iv. t. 42; Burman, Thes. Zeyl. t. 90 (*Ricinoides indica &c*), Gaertner, Fruct. Sem. Pl. t. 107; Plenck, Ic. t. 689; Nees von Esenbeck, Plant. Medic. Düsseld. t. 138; Woodville, Med. Bot. v. (1832) t. 21: Guimpel, Abbild. Beschr. t. 75; Hayne, Darst. Beschr. Gewächse, xiv. t. 3; Berg. & Schmidt, Darst. Beschr. Pharm. t. 17e (*Tiglium officinale*); Blanco, Fl. Filip. t. 383; Baillon, Adansonia, i. tt. 9 & 10, Hist. Pl. v. pp. 130–131, ff. 196–202; Bentl. & Trimen, Med. Pl. t. 239; Köhler Med. Pflan. i; Vidal, Fl. For. Filip. t. 83E; Journ. Coll. Sci. Tokyo, xx. 1904, t. 3, f. c.

Vernac. names.—Jamalgota (Jepal, *Bentley* & *Trimen*); Hazu (Japan, *Hayati*); Graine de Tilly ou de Moluques (*Köhler*).—Purging Croton.

Native of India and Malaya; found in Ceylon, Borneo, Philippines, and introduced to many tropical countries.

Seeds yield the "Croton oil" of the British Pharmacopœia. A sample of seed from Aburi, Gold Coast (Johnson, 1902) was valued in London at £25 per ton. There are fruits in the Museum, Kew (Col. and Ind. Exhib. 1886) from Assam described as "Koni Bish Poison" and the bark is said to be one of the ingredients of Arbor Arrow poison: it is intensely acrid and

when applied to the arm in a fresh state it causes irritation and raises pustules. Major Megaw, I.M.S. has found a watery extract of 0·63 grams and an alcoholic extract of 0·2 grams by injection sufficient to kill a guinea pig in 5 days and 4 hours respectively, proving that the fresh bark contains a poison of distinctly virulent type (Ann. Rep. Bd. Sci. Advice India, 1911–1912, p. 20). Major Windsor, I.M.S. finds that the Arrow poison of the Arbors is a paste made by pounding the soft parts of the plant and is not obtained from the seeds (Chem. & Druggist, Feb. 10th, 1912, p. 212; Indian Med. Gaz. Jan. 1912).

The plant grows freely at Old Calabar and other parts of the West Coast and in Tropical Africa generally under cultivation; but as with *Bixa Orellana* (*see* p. 57) the market for the seeds could readily be overstocked.

Ref.—" Croton Seeds " in Col. Rep. Misc. No. 88, 1914, Imp. Inst. p. 471, with analyses; from Nyasaland; and the Medicinal Works, &c. mentioned above.

JATROPHA, Linn.

Jatropha Curcas, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 791.

Ill.—Jacq. Hort. Bot. Vindob. iii. t. 63 (*Curcas indica*); Gaertner, Fruct. Sem. Pl. ii. t. 108 (*Curcas Adansonii*); Plenck, Ic. t. 691; Ruiz Lopez & Pavon, Fl. Peruv. t. 37 (*Castiglionia lobata*); Desc. Ant. ii. t. 141 (*Curcas purgans*); Jussieu, Euph. t. 11, f. 34A; Baillon, Etude Euphorb. t. 19, ff. 10–11 (*Curcas purgans*); Martius, Fl. Bras. xi. pt. 2. t. 68; Blanco, Fl. Filip. t. 384; Greshoff, Nutt. Ind. Pl. t. 45; Engl. & Prantl, Pflan. iii. pt. 5, p. 75, f. 45; Queensland Agric. Journ. vi. 1900, t. 195; Cook & Collins, Econ. Pl. Porto Rico (Contr. U.S. Nat. Herb. viii. 1903) t. 42; Safford, Pl. Guam (Contr. U.S. Nat. Herb. ix. 1905) t. 55; Transv. Agric. Journ. vi. 1908, t. 74; Notizbl. Bot. Gart. Berlin, App. xxii. No. 3, 1910, p. 103, f. 53; Talbot, For. Fl. Bombay, ii. p. 467, f. 502.

Vernac. names.—Bag-berenda (India, *Watt, Dymock*); Djarak (Java, *Simson Bros. & Co.*); Pulguiera (Cape de Verde, *MacGillivray*); Botije (Yoruba, *Foster*); Bi-ni-da-zugu or Chênedazugu (Hausa, Kontagora, *Dalziel*); Bagauro (Sierra Leone, *Scott Elliot*); Mupuluca (Golungo Alto, *Welwitsch*); Tuba (Phillipines, *Blanco, Safford*); Tubatuba (Guam, *Safford*); Sassi (Mozambique, *Negreiros*); Barané (French Guinea, *Pobeguin*); Mocassit Seeds (W. Africa, *Levin, Miller*); Pulza or Purqueira (Portuguese, *Spon*).—Curcas, Physic Nut. Pignon d'Inde; Pignon de Barbarie, Noix de Médecine, Grand Haricot du Pérou (*Descourtilez*, l.c.).

Common throughout Tropical Africa, including Nigeria and in many other tropical and sub-tropical countries,

The seed is the source of " Pulza Oil " or " Seed Oil " of Commerce—an important industry between Cape Verde Islands and Lisbon exists to the value of (in 1911) 100,205,000 Reis and

in 1912, value 76,788,822 Reis (Cons. Rep. Ann. No. 5284, 1914 p. 7). One thousand pounds of seeds give 640 lb. of kernels, which by expression yield 260 lb. of oil (Spon's Encycl. p. 1410). The oil is used in the manufacture of soap and candles; medicinally in India (Watt, Comm. Prod. India, p. 699). The seeds "in Kontagora are crushed and boiled, mixed with guinea corn pap and taken as a remedy for ascites, probably acting by causing diarrhœa" (Dalziel, Bull. Imp. Inst. 1907, p. 263); they are used in Golungo Alto as a purgative medicine (Hiern, Cat. Welw. Afr. Pl. iv. p. 968) and on the Gambia for the same purpose, prepared for use by roasting in wood-ashes for about 10 minutes (Bull. Imp. Inst. ii. 1904, p. 170). The cake left after expression of the oil is not suitable for feeding cattle—a note on some cases of poisoning in Germany is given in the Journal of the Board of Agriculture, Oct. 1913, p. 616), the juice of the tree, "when dried in the sun forms a reddish-brown brittle substance like shellac or kino, and is said to dye linen black" (Watt, l.c. p. 699). Cultivated for the purgative oil from the seeds by the natives of Shupanga, Tette, E. Africa (Kirk, Herb. Kew), and in Sao Vincente, Cape de Verde (MacGillivray, No. 132, July 1852—Voy. of H.M.S. "Herald"), grows wild in these islands especially in St. Jago and Fogo and the Government has from time to time made large plantations of it (Cons. Rep. Ann. No. 5063, 1913, p. 4), as a hedge plant in and around villages, Yoruba (Foster, Nig. Trees & Pl. p. 60) and commonly used everywhere for the same purpose. Grown in Madagascar as supports for "Vanilla" (*Vanilla planifolia*; *q.v.* p. 653) usually 1 or 1½ metres apart in rows distant about 2 metres from one another (Perf. & Ess. Oil Rec. May 1914, p. 152).

A shrub or tree 10–20 ft. high or stands cutting or lopping to any height, easily propagated by cuttings, *i.e.* tropical cuttings, 3–6 ft. pieces, and to use a common expression, grows like a weed.

Ref.—The illustrated works mentioned above and "*Jatropha Curcas*," in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 274–277 (Trübner & Co. London, 1893).——"Seeds of *Jatropha Curcas* (Purging Nut) from Lagos," in Bull. Imp. Inst. 1904, pp. 170–171.——"Purging Nuts," in Col. Rep. Misc. No. 88, 1914, pp. 470–471, with analyses—from Lagos.——"Seeds of *Jatropha Curcas* from Lagos," in Notes on Nigerian Trees & Plants, Foster, pp. 60–61, including analyses.

Jatropha gossypifolia, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 783.

Ill.—Jacq. Ic. Pl. Rar. iii. t. 263; Lodd. Bot. Cab. t. 117; Martius, Fl. Bras. xii. pt. 2, t. 69, f. 2; Talbot, For. Fl. Bombay, ii. p. 468, f. 503.

Vernac. names.—Lobotuje pupa (Lagos, *MacGregor*, *Phillips*, *Dawodu*); Olobontije-pipa (Oloke-Meji, *Foster*).

Lagos, Yoruba and generally in West Africa, from Senegal to Nigeria and widely distributed in the Tropics.

Plant used to make fences in all the Yoruba towns (Barter, Herb. Kew).

A shrub about 6 ft. high, easily cultivated in the same way as the foregoing species.

Jatropha multifida, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 784.

Ill.—Salisbury, Hort. Parad. Lond. t. 91; Martius, Fl. Bras. xi. part 2, t. 69, f. 1; Blanco, Fl. Filip. t. 342 (*J. Janipha*); Pax, in Engl. Pflanzenr. iv. Euphorb.—Jatrophae, p. 40, t. 13 (leaf ⅓ nat. size).

Vernac. names.—Ege (Lagos, *MacGregor, Phillips*); Iboisa (Benin, *Unwin*); Pinhoen (Brazil, *Dymock, Moloney*).

Lagos, Benin, and in West Africa from Senegal to the Cameroons. A native of America, and found in Texas, Mexico, the West Indies and Brazil.

Oil from the seeds, known as "Pinhoen" oil, is used in Brazil as an emetic, and the oil according to Soubeiran is very similar to if not identical with that of *Curcas*. Cases of accidental poisoning by the fruits have been recorded in India, chiefly among children who have been attracted by their tempting colour (Dymock, Warden & Hooper, Pharm. Ind. iii. p. 277–278).

Grown chiefly as a hedge plant and for ornament. Cultivated in many villages of Lower Dahomey and Ivory Coast (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 314); everywhere by dwellings and also wild, Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 969).

A shrub or tree 6–20 ft. high: flowers brilliantly scarlet: easily cultivated; propagated by seeds or cuttings.

Aleurites, Forst.

Aleurites triloba, *Forst.*; Fl. Trop. Afr. VI. p. 814.

Ill.—Rumpf. Amb. ii. t. 58 ("Camirium"); Forster, Gen. Char. Pl. t. 56 (*A. triloba*); Lam. Encycl. t. 791 (*A. triloba*); Jussieu, Euph. t. 12 (*A. ambinux*); Bedd. Fl. Sylv. t. 276 (*A. moluccana*).

Candle Nut—Indian Walnut, Belgaume Nut, Country Walnut, Lumbang (Philippines), Bankul (French Colonies).

Native of Polynesia and Malaya; distributed by cultivation to India, Burma, Ceylon, Hongkong, Mauritius, West Indies, East Africa, Madagascar, Hawaii and also experimentally in the Cameroons.

The kernels have been found to contain approximately 60 per cent. of oil suitable for various industrial purposes—manufacture of soft soap, oil varnishes, paints, linoleum, &c. (Col. Rep. Misc. No. 88, 1914, pp. 449–450: Kew Bull. 1917, p. 340). One ton of nuts are said to yield 40 gallons of oil (l.c. 1915, p. 484). The cake is not recommended for feeding purposes as

it has a poisonous effect on cattle (Bull. Imp. Inst. 1914, p. 128). The bark is said to contain 22 per cent. of Tannin ; used in Japan ; but on account of the red colouring matter associated with it, neither the bark nor extract would find a ready market in Europe (Agric. Ledger, No. i. 1902, p. 51) and bark from Hong Kong has been found not to contain enough tannin to make it suitable for use as a tanning material (Bull. Imp. Inst. 1913, p. 423).

A tree 40–60 ft. high, may be propagated from seed ; cultivation would seem to be comparatively easy ; planting recommended 25–30 ft. apart in protected situations up to 2600 ft. above sea-level and the tree is said to bear at the end of the second year (Kew Bull. 1917, p. 341).

Ref.—" *Aleurites moluccana*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 163–164.——" *Aleurites moluccana* from the Cameroons," Pharm. Journ. [4] xviii. 1904, p. 681.——*Aleurites moluccana*, The Candle Nut, Abbey Yates, in Agric. Ledger, No. 4, 1907, pp. 25–33.——" *Aleurites triloba*," in Comm. Prod. India, Watt, p. 47.——" Candle Nuts (*Aleurites triloba*)," Bull. Imp. Inst. 1912, pp. 44–45.——" Candle Nut or Indian Walnut," Kew Bull. 1917, pp. 340–341.——" Candlenut (Kekuna) Oil as an Industry," Trop. Agric. xlviii. May 1917, pp. 300–302.——" The Lumbang Oil Industry in the Philippine Islands," Aguilar, in Philippine Journ. Science, xiv. March 1919, pp. 275–285.

MANNIOPHYTON, Müll. Arg.

Manniophyton africanum, *Müll. Arg.;* Fl. Trop. Afr. VI. Sect. 1, p. 818.

Ill.—Hook, Ic. Pl. tt. 1267, 1268.

Vernac. names.—Casso or Gasso, N'Kam, Ekoum (Congo, *Heckel*) ; Losa, N'kosa (Belgian Congo, *Malvaux*) ; Congo glon-congo (St. Thomas, *Welwitsch*).

Old Calabar River (Mann, No. 2308, Herb. Kew) Oban (Talbot, No. 180, Herb. Brit. Mus. & 614, Herb. Kew) and common in West Africa from Sierra Leone to the Cameroons, extending to the Gaboon, and the Congo.

" Losa " or " Nkosa " is described as a liane with fibrous bark attaining a length from 30–80 ft. ; 20 kg. of green stems yielding 2 kg. of bark giving 350 grams of dry fibre. The liana is cut in pieces 2–2½ ft. in length, the fibres are short and tear obliquely, they are scraped with a knife to free them from all pectic matter and placed in the sun to dry ; the prepared fibre is used for making ropes and hunting and fishing nets—stronger and more durable than those of the " Akonge " (*Triumfetta semitriloba*), in the Belgian Congo (Bull. Agric. Congo Belge, iii. 1912, *seq.* Bull. Bur. Agric. Intellig. Rome, 1912, p. 266). In connection with bark sent from the Belgian Congo (1917) it was stated that " unless a good strong clean fibre can be prepared by retting it seems unlikely that the material would be of any value in Europe (Bull. Imp. Inst. 1917, p. 491). The

kernels of "Casso" or "Gasso" from the province of Likoala, French Congo, are reported to yield about 50 per cent. of oil suggested for use in paint manufacture (Bull. Imp. Inst. 1911, p. 159). A var. *fulvum*, Hutchinson (Fl. Trop. Afr. l.c. p. 819) is recorded from the Lower Congo and Angola and the above notes may also apply to this.

Ref.—"Nkosa (*Manniophyton africanum*)," in Bull. Agric. Congo Belge, iii. 1912, p. 620 with illustration—extraction of the fibre, f. 434.——"Nkose or Kossa (*Manniophyton africanum*)," in The Rubber Industry, 1914, advt. "The Belgian Congo," pp. 13–14.——"*Manniophyton africanum*" in "Fibres from the Belgian Congo," Bull. Imp. Inst. xv. 1917, pp. 491–492.

Caperonia, St. Hil.

Caperonia palustris, *St. Hil.;* Fl. Trop. Afr. VI. Sect. I, p. 832.

Vernac. name.—Fourou (Bambara, *Prain*).

Lagos, River Benue, Garua in Nigeria, Cameroons, and found in other parts of Tropical Africa including French Guinea, Mozambique District, East Africa, &c. also in South Africa, Madagascar, and South America.

The Bozos use the fibre of this plant to make fishing lines (Fl. Trop. Afr. l.c.).

An annua plant 2–3 ft. high.

Manihot, Adans.

Manihot dichotoma, *Ule;* Fl. Trop. Afr. VI. Sect. 1, p. 841.

Ill.—Hook. Ic. Pl. tt. 2876, 2877; Notizbl. Bot. Gart. Berlin, v. No. 41A, f. 1A–B; Pax in Engl. Pflanzenr. Euphorb.-Adrianeae, p. 83, f. 11, A–B, f. 15, F–H.

Vernac. names.—Jequié or Jequié Maniçoba (Brazil, *Ule*).

Cultivated in Tropical Africa, Ceylon, Singapore, West Indies and various Botanical and Agricultural Stations from seeds sent out from Kew about 1908; native of Brazil (Bahia).

A tree 10–14 ft. high; grown as a rubber plant; for general particulars *see* the following species and *piauhyensis*. The seeds germinate especially easily, an advantage over the other species (Kew Bull. 1908, p. 68).

Ref.—"Jequie Maniçoba and Its Allies," Kew Bull. 1908, pp. 59–68 and in The India Rubber Journ. March 9th, 1908, pp. 261–263.——"Jequie Maniçobas," Kew Bull. 1910, pp. 204–206.——"The Jequié Maniçoba Rubber Tree," Thomson, in The Indian Forester, xxxvi. Jan. & Feb. 1910, pp. 1–9; reprint in "Tropical Agriculturist," xxxiv. May 1910, pp. 393–397.——"The Jequie Maniçoba Rubber Tree," in Agric. News, Barbados, ix. 1910, p. 211.——"The New Manihots," in The Whole Art of

Rubber Growing, Wicherley, pp. 110–118 (The West Strand Publishing Co. Ltd. London, 1911).

Manihot Glaziovii, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 839.

Ill.—Kew Report, 1880, p. 16; Journ. Bot. 1880, t. 215; Köhler, Med. Pflan. iii.; Engl. & Prantl, Pflan. iii. pt. 5, p. 79, f. 48; Jumelle, Pl. Caoutchouc et a Gutta, p. 25, f. 2; Tropenpfl. iii. 1899, p. 50, p. 111, ix. 1905, Beihefte, p. 273; De Wildeman, Mission E. Laurent, t. 42; Yves Henry, Caoutchouc Afr. Occid. Franç., pp. 189, f. 4, 191, f. 5 & t. 8; L'Agric. prat. pays chauds, viii. pt. 1, 1908, p. 99; Bull. Agric. Congo Belge, i. 1910, p. 255, t. 87; iv. 1913, p. 172, f. 59 (Allée à Kalamu, Bas Congo); Pax in Engl. Pflanzenr. Euphorb.-Adrianeae, f. 31; Dudgeon, Agric. & For. Prod. W. Afr. p. 9, t. 5 (Tree at Bakau, Gambia).

Ceara Rubber; Maniçoba Rubber.

Cultivated in probably every British Colony within the Tropics including Nigeria and in East (formerly German) Africa Togoland, French West Africa, Belgian Congo, Mozambique, &c. The Colonial distribution began with seeds and stems collected by Cross for the Government of India, in Ceara, from which a stock was propagated at Kew in 1876 (Kew Rep. 1876, pp. 12–14) and plants were first sent out in 1877 to Singapore, Calcutta and Ceylon (l.c. 1877, p. 16).

As a rubber plant it appears so far to have been the most successful on a paying scale in that part of East Africa formerly under German rule, where it was first planted experimentally at Tanga and Dar-es-Salaam in 1890–1900. From "Lewa Plantation," the oldest, near Tanga, 3½ tons in 1905, 7½ tons in 1906 and 12½ tons in 1907 (*i.e.* "tonnen" of 1000 kg. each) were exported; at the present time the production has developed into an industry of importance. The varying success attending the efforts in various parts of the British Empire are enumerated in the Kew Bull. for 1898 and from time to time samples of rubber have been contributed to Kew from India, Ceylon, B. E. Africa, Uganda, Sudan, Zanzibar, Fiji, Sierra Leone, &c. In Nigeria, in 1898 at Old Calabar there were 20 young plants established, three of the largest bearing seeds (Ann. Rep. Bot. Dept. 1897–8), in 1911 more extensive experiments were in hand, 3 acres being reported planted in the Mamu Reserve; 800 plants put out in the Ilaro Reserve and communal plantations started in the Central and Eastern Provinces (Thompson, Ann. Rep. Forestry Dept. S. Nig. 1911, pp. 6, 7, 8), and in the same year at Ibi, Muri Province, it is reported (for Sept. quarter 1910) a considerable number of Ceara Rubber Trees were growing, planted it was believed 10 or 12 years before by Mr. Hewby (N. Nig. Gaz. April 29th, 1911, Suppl. p. 9), in 1913 at Bida, N. Nigeria trees tapped on the "Lewa system" (*see below*) yielded rubber valued at 3*s.* 6*d.* per lb. in London with fine hard Para at 3*s.* 11*d.* per lb. (Bull. Imp. Inst. 1913, p. 380; Col. Rep. Ann. No. 816, 1914,

p. 27); 1913—in a plantation at Aakpa $2\frac{1}{2}$ acres of Ceara seedlings were thriving well (Nicol, Ann. Rep. Dept. Agric. N. Nig. p. 15) and in 1914 Ceara Rubber was reported as doing remarkably well at Bassa, Northern Provinces (Lamb, l.c. 1914, p. 3).

The tree is easily grown from cuttings or from seed which germinates quickly—if carefully filed near the radicle end or soaked well in water before sowing—and grows freely to a height of 30–50 ft., with the trunk 1–$1\frac{1}{2}$ ft. in diam.; when planting out a distance of from 10–15 ft. about should be allowed; the best plan is to sow the seeds in the prepared ground where it is intended they should remain permanently, 2 seeds at each distance given—the strongest plant can be selected and the other transplanted to fill up some vacancy in the plantation. As the ground is soon covered interplanting or catch-crops are not advisable except for the first year or two. A hot dry climate and soil is required for rubber production though the tree to all appearances is successful in a hot moist climate. The yield of rubber is estimated at about 25 grams per tree in the third and fourth years and 125 grams per tree afterwards on an average over a large area, though some trees may produce considerably more. The "Lewa-method" which seems to have been found very successful is by cleaning portions of the cortex, by the removal of bits of bark and painting over with dilute acetic, citric or carbolic acid, or with fluoric acid ("purub"), and then making almost point-like incisions from which the latex flows and coagulates as thin tears of rubber on the tree; these tears are collected and worked up into round balls (Kew Bull. 1911, p. 98). The tree may also be tapped on the herring-bone system or as recommended for *Hevea* (*q.v.*) after peeling off the outer bark. To admit of collecting the latex in vessels at the foot of the vertical incisions, the usually rapid coagulation is delayed by trickling water or water containing ammonia on to the cut surfaces. It is recommended that every tree in a plantation should be tested before it is two years old and if found to yield a thin watery latex, it should be cut out and the place filled up with a cutting from a tree giving a thicker and more profitable latex (Smith & Bradford, Hawaii Bull. No. 16, *seq.* p. 13).

The flowers are suggested as a source of honey but more especially for the bees-wax, B. E. Africa (Ann. Rep. Dept. Agric. B. E. Africa, 1911–12, p. 88) and in Dahomey (L'Agric. Col. Italy, Sept. 1910, p. 323). The value of the honey, however, as coming from a plant belonging to *Euphorbiaceae* is open to question.

Ref.—"Ceara Rubber," Kew Bull. 1898, pp. 1–15 and in Add. Series vii. "Rubber," 1906, pp. 117–131.——"Good and Bad Cearas: How to Distinguish Them," Trop. Agriculturist xxiv. July 1st, 1904, p. 8.——"Le Maniçoba," Moulay, in L'Agric. prat. pays chauds, v. 2, 1905, pp. 298–310; pp. 368–

376, illustrated.——" Ceara Rubber in Portuguese East Africa," Johnson, in Bull. Imp. Inst. v. 1907, pp. 401–422.——The Ceara Rubber-Tree in Hawaii, Smith & Bradford, Hawaii Agric. Exp. Station, Bull. No. 16, 1908, pp. 1–29, pls. i–iv.——" Rubber Cultivation in Togoland and German East Africa," Kew Bull. 1911, pp. 97–100.——" Rubber " in The N. Nigeria Gazette, Nov. 30th, 1911, Suppl. pp. 317–318.——" *Manihot Glaziovii*," in The Whole Art of Rubber Growing, Wicherley, pp. 47–84, with illustrations of Tapping Methods, &c. (The West Strand Publishing Co. Ltd. London, 1911).——" Ceara Rubber " in Col. Rep. Misc. No. 82, 1912, pp. 285–298.——" Report on Ceara Rubber from N. Nigeria," Dunstan, in N. Nig. Gazette, July 15th, 1913; Suppl. p. 268.

Manihot piauhyensis, *Ule*; Fl. Trop. Afr. VI. Sect. 1, p. 840.

Ill.—Notizbl. Bot. Gart. Berlin, v. 1908, pp. 22 C–H, 24 D–E and t. 3; Pax in Engl. Pflanzenr. Euphorb.—Adrianeae, p. 33, f. 11 C–H; p. 44, f. 15 C–E.

Vernac. name.—Piauhy Maniçoba (Brazil, *Ule*).—Piauhy Rubber.

Native of Brazil (Piauhy).

The yield of rubber from this species as also that from *M. dichotoma* is considered to be greater than that from *M. Glaziovii.* A small tree 6–16 ft. high, recommended for cultivation in light sandy soil. In the native method of tapping a small hole is dug in the ground on one side of the stem and lined with clay; scratches are then made just above the neck of the root and the latex flows into the little pit where it coagulates and is collected one or two days later. A cake of from 10–100 grams may be obtained from a single tapping (Kew Bull. 1908, p. 67).

Manihot utilissima *Pohl*; Fl. Trop. Afr. VI. Sect. 1, p. 842.

Ill.—Sloane, Hist. Jam. i. t. 85 (*Ricinus minor*, &c.), t. 141 f. 1 (Radix Ricini Cassada); Tussac, Ant. iii. t. 1 (*Jatropha Manihot*); Desc. Ant. iii. t. 176 (*J. Manihot*); Velloso, Fl. Flum. x. t. 80 (*J. Manihot*); t. 82 (*J. stipulata*); Pohl, Pl. Bras. t. 24; Berg. Charact. t. 24, No. 199; Bot. Mag. t. 3071 (*Janipha Manihot*); Adr. Juss. Tent. Euphorb. t. 10, f. 33 (*J. Manihot*); Mart. Fl. Bras. xi. pt. 2, t. 65; Bentley & Trimen, Med. Pl. t. 235; Vidal, Fl. For. Filip. t. 83c; Agric. Gaz. N. S. Wales ii. 1891, t. 38; Köhler, Med. Pflan. iii; Engl. & Prantl, Pflan. iii. part 5, f. 49; Transv. Agric. Journ. ii. t. 24; Safford, Contr. U. S. Nat. Herb. ix. t. 26 (*M. Manihot*); Zippel, Ausl. Handels Nährpfl. t. 58; Karst. & Schenck, Veg. bild. i. t. 10; viii. t. 45; Savariau, L'Agric. au Dahomey, f. 10 (Pied de Manioc); Pax, Das Pflan. Euphorbiaceae-Adrianeae, f. 24.

Vernac. names.—Rogo (Hausa, Kano, *Dudgeon*, *Dalziel*); Bara banankou (Valley of the Niger, *Dumas*); Duaday, Bantschi (Gold Coast, *Easmon*); [Yuca (West Indies, Central America,

&c.); Huacamotl (Mexico); Maniba, Manira, Mandioca, Manioc (Brazil), Mandioca (W. Africa), Mhogo (E. Africa); Hoci dangdur, &c. (Java), Quisaca (Loanda) *Pax*] Cassada (Jamaica, *Sloane*).—Tapioca; Cassava, Manioc, Bitter Cassava, Bay Rush (Bahamas, *Simmonds*); Brazilian Arrowroot.

Nupe (Barter No. 1497, Herb. Kew); Lagos (Barter, No. 20195 Herb. Kew), throughout W. Africa and widely distributed in the Tropics under cultivation.

The flour or starch obtained from the large tuberous roots is everywhere an important food. The flour has somewhat the appearance of coarse oatmeal and "Tapioca" the preparation best known in this country is a pure form of starch which settles from the water in washing the Cassava meal and afterwards granulated on hot plates. "Gaplek" is a dried preparation of "Cassava," carried out in Java, where it is used as a substitute for rice (Agric. Bull. Fed. Mal. St. 1919, p. 370). A preparation called "Vermicelli" is made of this starch and rice in Annam, Indo-China, and "Hotien" is a food-paste made from the root also in Indo-China. Bread and cakes are made with the meal in the West Indies, &c. (Mus. Kew) and in Nigeria the food-stuffs "Fu-fu"—dough-like and "Garri" dried and grated are prepared from the root. "Couac" is a coarse meal prepared by crushing and drying the root in Brazil. "Cassareep" is a well-known sauce, made by boiling down the juice of the root in the West Indies, where together with "Capsicums" it forms the "pepper pot" of the country. The starch is of growing importance for uses similar to those of Rice Starch, as a source of alcohol, glucose, &c.

The above products are chiefly from the "bitter cassava," the preparation and cooking rendering the poisonous matter of the raw root inert; but the "sweet cassava," the form usually cultivated in the United States (Tracy, *seq.* p. 6), is good fodder in a fresh condition for all kinds of stock, advisedly with some nitrogenous feeding-stuff such as bran, cotton-seed meal, &c. (Tracy, U.S. Dept. Agric. Farmers' Bull. No. 167, 1903, p. 23). The residues of the Cassava Starch and Tapioca factories are also used for feeding stock. Javan manioc roots are reported to have been sent to Germany for the manufacture of commercial starch and the residues put on the market as feeding stuffs under the names of "Starkefutter-mehl," "Starkeschlempe," "Pflauzenmehl," "Schlempemehl" and "Webco," and manioc root residues are also known in the European Feeding-stuffs Trade as "Hollandisches Futtermehl," "Tapioka-Ampas," "Strumbin," "Starkeabfall," &c. (Bull. Bur. Agric. Intell. Rome, 1913, pp. 1583–1586—Manioc Roots and the Residues of their Elaboration).

There are two well-marked variations in the roots—dark and light-coloured—usually distinguished as "Sweet" (sometimes called *M. palmata*, var. *Aipi*) and "Bitter" (*M. utilissima*), the last-named as indicated above being more or less poisonous

in a fresh state [*see* Leather, "Cyanogeneses in Plants," Agric. Journ. India, i. 1906, pt. 3, pp. 223–224; Dunstan, Henry & Auld, "Phaseolunatin in Cassava," Proc. Roy. Soc. lxxviii. 1906, pp. 152–158], and under cultivation there are numerous varieties of both forms often confined to certain localities. In India there are two classes, distinguished as "Avians or easily boilable kinds" and "Maravans or dark races," varying in height from 3–25 ft.; age at maturity 6–15 months and average weight of roots 4–25 lb. (Sawyer, Indian Forester, 1895, p. 290: Burkill, Agric. Ledger No. 10, 1904, p. 125), the yield per acre varying from 2500 lb. to 30,000 lb. (l.c. p. 145). The West Indies, Colombia, Brazil, &c., all have many varieties, native or introduced and it would be quite impossible to detail them here (*see* refs. at end); they include such names as "Bunch of Keys," "Yellow Belly," "Blue" "Black-" "White-" "Brown-" "Butter-" "Sweet" and "Silver" Sticks; "Red Jacket," "Red" and "White Greenaway," &c.

In Nigeria and Dahomey three principal varieties are distinguished—"Black Manioc," with a dark-coloured stalk, a root with a black cortex and numerous roots, 10 to 15 in good soil, attaining a length of 24–28 in.—"White Manioc," light-grey stalk, few roots, 3 or 4 of large size, sometimes 39 in. in length, and half-a-dozen smaller ones,—and "Red Manioc" with red-brown stalk, roots with a reddish-brown cortex, numerous, but of smaller size than in the two foregoing. The black is said to yield the best flour and the white is grown especially for making flour. The period of growth varies according to the purpose for which the plants are required; the red and black are the earliest, the roots being dug up at 5, 7 or 8 months if they are to be eaten cooked and after 2 or 3 years if they are to be made into flour, the white as indicated above being usually grown as it yields the heaviest crops—this having been found in Dahomey to be from 16,800–32,100 kg. per ha. (134–256 cwt. per acre) (Henry & Ammann, "Les Manioc Africain" *seq.*). These authors also state that the three principal varieties grown in Dahomey on other than forest land give a product which can be eaten without further treatment, but the roots of two of the same varieties—red and white, cultivated on forest soil in Nigeria contain so much hydrocyanic acid as to give rise to serious accidents.

The principal requirements are rich, light well-drained soil, a hot climate at all seasons and a moderate rainfall. Plants may be raised from seed but cuttings 6 in. or more long are recommended, planted in rows 4 ft. apart or thereabouts in the field, or they may be rooted in nursery beds, put in at the beginning of the rainy season or at any time when a sufficient degree of moisture can be assured. In the United States it is recommended to put in cuttings 4–6 in. in length in ploughed furrows, like planting potatoes, and covering with 2–4 in. of soil (Tracy, U. S. Dept. Agric. Farmers' Bull. No. 167, 1903,

pp. 13, 14). In Malacca planting is done with 4 in. cuttings $\frac{1}{2}$–$\frac{3}{4}$ in. thick, laid flat $\frac{1}{2}$ in. below the soil, 4 ft. by 4 ft. for the first crop and 3 ft. by 3 ft. for the second and third; the crops are ready in 20, 17 and 14 months respectively when the light variety is planted and 10 months with the dark variety (Bamber. Roy. Bot. Gardens, Ceylon, Circ. No. 13, Oct. 1908, p. 103), Harvesting is started when the roots are mature which may vary as stated above according to variety, if for the production of starch they should be treated immediately and if for food dug up as required. In the Hausa, Yoruba and Nupe Countries under cultivation it is an unmanured plant, usually grown in separate fields surrounded by mud walls or guinea-corn matting hedges made of intertwined thorn branches, planted *Euphorbia*, *Jatropha* or *Acacia*, the crops following being usually cotton, the field for this being manured; near Bida (Nupe) cassava is frequently grown as a shade crop for onions, in this case being planted around the onion beds twenty days after the planting of the onions and harvested a month later than this crop; the high state of cultivation necessary for the onions is beneficial to the Cassava (Dudgeon, Agric. & For. Prod. W. Afr. p. 152; 3rd Ann. Rep. Agric. N. Nig. Gaz. July 31st, 1909, pp. 150, 157).

For export the root may be dried, made into starch or prepared as "Tapioca." In drying the root the usual practice in India is to first remove the skin, then cut into thin slices and expose them to the sun for five or six days consecutively until quite dry (Pillay, Agric. Journ. India, iv. 1909, p. 85).

Cassava starch is made in much the same way as that of Arrowroot (*Maranta arundinacea*, *q.v.* p. 668) and briefly the roots are washed peeled and grated (by machinery) and the grated mass washed and re-washed until the deposit—all the lighter particles float off—or starch is a pure white, after which it is dried and packed for use as starch or the semi-dried mass is made into Tapioca—the following being the method practised in the Straits Settlements,—"At this point (completion of the manufacture of the starch the processes for the making of pearl and of flake tapioca diverge. Pearl tapioca is made by taking the damp half-dried blocks of starch breaking them up and in a cloth by a jerking backwards and forwards movement making the meal to form into pellets. The jerking requires skill and upon the way in which it is done the size of the pearl depends. By means of sieves the pearls are afterwards graded and then torrefied in big ovens on hot plates. Flake tapioca is made by taking the starch slightly damp and putting a thin layer on the hot plates, stirring gently until it is torrefied enough." (Burkill, Agric. Ledger, No. 10, 1904, p. 137).

It is probable that where starch can be prepared it is better to ship it as such or prepared as "Tapioca," and up to 1909 cassava from Brazil was almost entirely shipped in the form of flour; but it has been found that it is more remunerative, owing to the difficulties of grinding and preparing it, to export the

root cut into small round pieces and dried in the sun (Cons. Rep. Ann. No. 4575, 1910, p. 30). It has further been stated that in Brazil "the best and most important feature of the manioc industry is its exportation in dried pieces, which the European markets insist on for the manufacture of alcohol" (Journ. Roy. Soc. Arts, 1913, p. 1064). The yield of alcohol is 59·8 litres per cent. on the starch contained in the dried roots which averages 67 per cent., and the manihot washes give satisfactory results when used for the manufacture of pressed yeast (Inter. Sugar Journ. 1909, p. 612); 68·53 per cent. of starch in the dry root, 24 per cent. in the fresh root and 84·63 per cent. of starch in the flour are typical results quoted from over 100 analyses of cassava roots grown in Jamaica (Bull. Imp. Inst. 1903, p. 38).

A sample of dried and grated Cassava ("Garri") from Nigeria was valued in 1909 at 6*s*. to 6*s*. 6*d*. per cwt. for ordinary manufacturing use, whilst a firm employing starch for the preparation of glucose to be used in brewing, reported that this granulated Cassava might be worth £7 7*s*. 6*d*. per ton for their purposes (Col. Rep. Ann. No. 665, 1911 (for 1909), p. 33). In 1911 Johnson (Rep. Agric. Dept. S. Nig. 1911, pp. 4, 5) found by experiment with 2 acres, plants 4 ft. × 4 ft. that the cost of cultivation was, for forming land and clearing ridges £2 18*s*. 6*d*., making cuttings for planting 8*s*.; planting 8*s*. 8*d*.; hoeing and weeding, £3 13*s*. 3*d*.; harvesting crop £1 7*s*. 7*d*.—total £8 16*s*. 0*d*.; the yield of fresh cassava per acre, was 13,679 lb. peeled, and dried 4,594 lb.; and prepared "garri" 3,720 lb.; it was considered in view of the probable cost of "Garri" for the preparation of glucose at £7 7*s*. 6*d*. per ton, but difficult to sell in competition with East Indian Sago flour at the same price or up to £7 10*s*. that it was doubtful whether the meal or dried root could be exported to England at a profit. The prospects of Cassava Starch as an Industry were being discussed in 1903 (Agric. News, Barbados, Dec. 5th, 1903. p. 393; Cousins, Bull. Dept. Agric. Jamaica, March 1904; Agric. News, Barbados, April 23rd, 1904, p. 137; May 7th, 1904, p. 150; May 21st, 1904, pp. 161–162) and in January of that year a ton of starch was shipped to England from Jamaica for the purpose of testing the market, the results being reported as entirely satisfactory; a price of £10 per ton in Bristol was offered with a request that 50 tons should be shipped at the earliest opportunity (l.c. p. 161); it suited the finishers of high class goods in Manchester who then used for their finer processes wheat starch costing on an average £27 per ton (l.c. April 23rd, 1904, p. 137). Cassava starch was exported from St. Vincent in 1908 (236,502 lb. value £1,352) (Rep. Agric. Dept. St. Vincent, 1912–13, p. 19). The main sources of Cassava products—described as "Mandioca or Tapioca Flour" and "Cassava Powder" and "Tapioca" are Netherlands, Java, Brazil and Straits Settlements, from whence a total in 1913 of 933,495 cwts—value £498,679, were imported (Trade of the United Kingdom, 1918, p. 100).

Ref.—" Manioc or Cassava," in Tropical Agric. Simmonds, pp. 349–352 (E. & F. N. Spon, London, 1877).——" *Manihot utilissima*," in Med. Pl. Bentley & Trimen, No. 235, 5 pages (Churchill & Son, London, 1880).——" Tapioca, Cassava, or Brazilian Arrowroot (Jatropha Manihot (Bitter Cassava) : Manihot Aipi (Sweet Cassava)," in Cultural Industries for Queensland, Bernays, pp. 176–180 (Govt. Printer, Brisbane, 1883).——" *Manihot utilissima*," in Med. Pflan. Koehler, iii. pp. 4.——" *Manihot utilissima*, & *M. Aipi*," in Dict. Econ. Prod. India, Watt, v. 1, 1891, pp. 157–164.——" The Cultivation of the Bitter Cassava (*Manihot utilissima*, Pohl) together with a few notes on Sweet Cassava (*M. Aipi*. Pohl.)," Turner, in Agric. Gaz. N. S. Wales, ii. 1891, pp. 381–384.——Sweet Cassava : Its Culture, Properties & Uses, Wiley, U.S. Dept. of Agric. Div. of Chemistry, Bull. No. 44, 1894, pp. 1–16, illustrated.——" Tapioca Cultivation in Travancore," Sawyer, in Indian Forester, xxi. 1895, pp. 290–296.——" *Manihot palmata* (Vell.) Müll. Arg. var. *Aipi*, Pohl.—Maniok, Süsse Kassave, Süsse Mandioka " ; in Pflan. Ost-Afrikas, Engler, part B. pp. 141–144 (Berlin, 1895). ——" Manioc," in Les Drogues Simples d'origine Végétale, Planchon & Collin, pp. 331–334 (Octave Doin, Paris 1895).——*Manihot utilissima ;* also *M. palmata*, in Agric. Ledger, No. 4, 1897, pp. 1–20.——" De Cultuur van Cassave &c." De Bie, in Teysmannia ii. 1900, pp. 273–298.——" Maniok," in Die Tropische Agrikultur, Semler, ii. pp. 766–788 (Wismar, 1900).——The Manufacture of Starch from Potatoes and Cassava, Wiley, U.S. Dept. Agric. Div. of Chemistry, Bull. No. 58, 1900, pp. 1–48, with particulars of Machinery and Starch Factory, illustrated.——" *Manihot utilissima* : The Tapioca Plant considered as an alternative Foodstuff in Seasons of Scarcity & Famine," in Agric. Ledger, No. 15, 1900, pp. 161–168.——" Report on Cassava," Thomson, Bull. Bot. Dept. Jamaica, ix. 1902, pp. 81–87.——" Maniok-Kultuur, in Deutsch-Ostafrika," in Der Tropenpflanzer, vi. 1902, p. 251.——" Jamaica Cassava : Analysis of Selected local varieties," Cousins, in Bull. Dept. Agric. Jamaica, i. 1903, pp. 130–134 ; l.c. ii. 1904, pp. 37–42 " Le Dérivés du Manioc," Neuville, in Journ. d'Agric. Trop. iii. 1903, pp. 323–328.——Cassava, Tracy, U.S. Dept. Agric. Farmers' Bull. No. 167, 1903, pp. 1–32, illustrated.——" Cassava as a Source of Starch and Allied Products," Bull. Imp. Inst. i. 1903, pp. 38–40.——" Cassava Poisoning," Agric. News, Barbados, Dec. 31st, 1904, p. 423.——" The Tapioca Plant : Its History, Cultivation, and Review of Existing Information," Burkill, in Agric. Ledger, No. 10, 1904, pp. 123–148.——" The Prospects of Cassava Starch," Cousins, in Bull. Dept. Agric. Jamaica, ii. 1904, pp. 49–51.——" Cassava Trials," Cousins, l.c. iii. 1905, pp. 152–155, with Tabular description of Jamaica Cassavas.——" Le Manioc " : Culture et Industrie à la Réunion. Colson & Chatel, in L'Agric. prat. des pays chauds, v. 2, 1905, pp. 269–297 ; pp. 404–419, and pp. 463–474.——" The Occurrence of Phaseolunatin in Cassava (*Manihot Aipi* and *Manihot utilissima*),"

Dunstan, Henry & Auld, in Proc. Roy. Soc. London, lxxviii. 1906, pp. 152–158.——" *L'Manihot dulcis* et *Manihot utilissima*, Dumas, in L'Agric. prat. des pays chauds, vi. 1, 1906, " L'Agric. dans la vallée du Niger," pp. 510–513.——" Tapioca as a Catch Crop for Rubber," Ridley in Agric. Bull. Fed. Malay States, v. May 1906, pp. 133–135.——" Tapioca as a Catch Crop," Dunman, l.c. July 1906, pp. 223–228.——" Cassava Trials: Native & Colombian Varieties," Cousins, in Bull. Dept. Agric. Jamaica, v. 1907, pp. 78–86, with descriptions of the plants.——" Cassava: Its Cultivation and Manufacture," in Trop. Agric. xxix. Aug. 1907, pp. 126–132; reprint in B. N. Borneo Herald Dec. 2nd, 1907, pp. 230–233.——Cassava: Its Content of Hydrocyanic Acid and Starch and Other Properties, Moore, U.S. Dept. Agric. Bureau of Chemistry, Bull. No. 106, 1907, pp. 1–30.——" Cassava as Famine Food, Booth-Tucker, in Agric. Journ. India, iii. 1908, pp. 227–230.——" The Cultivation of Tapioca in Travancore," Pillay, in Agric. Journ. India, iii. 1908, pp. 366–368.——" *Manihot utilissima*," in Comm. Prod. India, Watt, pp. 766–767.——" Tapioca, Manioca, or Cassava," Bamber, Roy. Bot. Gdns. Ceylon, Circ. No. 13, Oct. 1908, pp. 103–108.——" The Industrial Prospects of Cassava Starch," Cousins, in Bull. Dept. Agric. Jamaica, i. 1909, pp. 53–57.——" Der Maniok als Volksnahrungsmittel in Portugiesisch Ost Afrika," Mans, in Der Tropenpflanzer xiv. 1910, pp. 476–478.——Le Manioc, Hubert & Dupré, pp. 1–368 (Dunod et Pinat, Paris, 1910).——" Tapioca (Cassava) Flour and Starch " in Bull. Imp. Inst. x. 1912, pp. 562–565 including starch from Sierra Leone, Gold Coast, Natal, and " Garri " from S. Nigeria.——" Le Manioc Africain," Henry & Ammann, in L'Agric. prat. pays chauds, xii. 1912, pp. 353–368; transl. in Bull. Bur. Agric. Intell. Rome, iii. 1912 pp. 1769–1771.——" Cassava Starch and Its Uses," Everington, in West Indian Bull. xii. 1912, pp. 527–529.——" Cost of Cultivation of Cassava in St. Vincent," Sands, Agric. News, Barbados, xiii. 1914, p. 86.——" Cassava: Recent Developments in Trinidad," in Bull. Dept. of Agric. Trinidad, xiv. part 2, 1915, pp. 27–57, including " The Commercial Possibilities of Cassava," Vyvyan Board; " The Cultivation of Cassava," Freeman; " Cassava in St. Vincent," Birkinshaw; " Cassava as a Catch Crop with Coco-nuts "; " Prussic Acid in Sweet Cassava," Carmody; " Bitter & Sweet Cassava-Hydrocyanic Acid Contents," Collens; and " Alcohol from Cassava," Collens.——" Cassava: Its Cultivation and Utilisation," in Bull. Imp. Inst. xiii. 1915, pp. 581–611.——" Cassava Poisoning," in Agric. News, Barbados, xiv., 1915, p. 37.——" Tapioca Starch from Rhodesia," in Bull. Imp. Inst. xv. 1917, pp. 180–182.——" Cassava Refuse " in " Fodders," l.c. p. 118.——" Cassava as a Source of Industrial Starch and Alcohol," l.c. xvii. Oct.-Dec. 1919, pp. 571–578.

LEPIDOTURUS, Baill.

Lepidoturus laxiflorus, *Benth.*; Fl. Trop. Afr. VI. Sect. 1, p. 913.

Ill.—Hook. Ic. Pl. t. 1297; De Wildeman, Pl. Thonner Congol. ii. t. 4 (*Macaranga Thonneri*).

Vernac. names.—Uwenvwen (Benin, *Unwin*); Ijan or Ijan funfun (Yoruba, *Millson*).

Lagos, Yoruba, Benin, and in Nile Land, Belgian Congo, &c.

Leaves used to preserve Kola Nuts (*Cola acuminata*). Yoruba (Millson, Herb. Kew & Kew Bull. 1891, p. 217).

A shrub or small tree 15–20 ft. high; a common deciduous tree of the Yoruba forests (Barter, Herb. Kew).

ALCHORNEA, Sw.

Alchornea cordata, *Benth.*; Fl. Trop. Afr. VI. Sect. 1, p. 915.

Vernac. names.—Unwonwe or Unwonnen (Benin, *Dennett*); Bambammi (Katagum, *Dalziel*); Christmas Bush (Sierra Leone, *Scott Elliot*); Aramamila (S. Nigeria, *Dennett*); Ipa (Oloke Meji, *Foster*), Dumce (Golungo Alto, *Welwitsch*).

Oloke Meji, Benin, Kontagora, Katagum, Guarara River in Nigeria and widely distributed in Upper and Lower Guinea, Mozambique District etc.

Fruit eaten by birds, Batanga (Bates, Herb. Kew); leaves used as a hot press for feet, Sierra Leone (Scott Elliot, Herb. Kew). The negroes of Golungo Alto make a black dye by baking this plant mixed with the mud of a stream (Hiern, Cat. Welw. Afr. Pl. iv. p. 939).

A shrub or a small tree 3–12 ft. high.

RICINUS, Linn.

Ricinus communis, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 945.

Ill.—Rheede, Hort. Mal. ii. t. 32; Blackwell, Herb. i. t. 148 (*R. vulgaris*); Miller, Figures Beautiful & Uncommon Pl. Desc. tt. 219, 220; Jacq. Ic. Pl. Rar. i. t. 195 (*R. inermis*) t. 196 (*R. lividus*); Gaertner, Fruct. Sem. Pl. ii. t. 107; Schk. Handb. t. 312; Plenck, Ic. t. 690; Lam. Encycl. t. 792; Dict. Sc. Nat. t. 276; Bot. Mag. t. 2209; Desc. Ant. i. t. 59 (Ricin arbre), ii. t. 127 (Ricin annuel); Roeper, Enum. Euphorb. t. 1, ff. A–I (seed & germination); Hayne, Darst. Beschr. Gewächse, x. t. 48; Wagner, Pharm. Med. Bot. t. 33; Nees von Esenbeck, Plant. Medic. Düsseld. t. 140; Woodville, Med. Bot. iii. t. 221; Guimpel, Abbild. Beschr. ii. t. 113; Sibth. Fl. Gr. t. 952; Steph. & Ch. Med. Bot. i. t. 50; Penfold, Madeira, Fl. Fr. & Ferns, t. 3; Burnett, Pl. Util. ii. t. 56b; Spach, Suites (Hist. Nat. des Végétaux) t. 76, f. 1; Berg. & Schmidt, Darst. Beschr. Pharm. i. t. 1c; Baillon, Étude Euphorb. t. 10, t. 11; Rev. Hort. 1861, p. 10, f. 1 (Ricin en arbre); Baillon, Hist. Pl. v. pp. 110–111; Martius, Fl. Bras. xi. pt. 2, t. 60 (var. *brasiliensis*); Bentl. & Trimen, Med. Pl. t. 237; Köhler, Med. Pflan. ii; Duthie, Field Crops, t. 43; Vidal, Pl. For. Filip. t. 84F; Greshoff, Nutt. Ind. Pl. t. 31; Agric. Gaz. N. S. Wales, xvii. 1906, p. 173; Temple, Fl. & Trees, Palestine, t. 25.

Vernac. names.—Zurma (Hausa, *Dalziel*); Mbaliki (B. C. Africa, *McClounie*); Bafureira (Loanda, *Welwitsch*); Ambona (Mozambique, *Negreiros*); Diakoula (French Guinea, *Pobéquin*); Hurna (Kordofan, *Anderson*).—Castor Oil Plant; Palma Christi (Bot. Mag. l.c. in 1821); Common Palma Christi (Woodville, l.c. in 1832).

Widely distributed in Tropical Africa and in general, wild or cultivated throughout the Tropics. A variety with brilliant red seed spikes has been introduced to the Sudan from Borgu, Northern Nigeria, said to be superior to the indigenous variety and to produce larger seeds (Col. Rep. Misc. No. 88, 1914, p. 505). Prominent African varieties as described in the Flora of Tropical Africa (l.c.) are :—

Var. **genuina**, *Müll. Arg.*, throughout Tropical Africa.

Var. **africana,** *Müll. Arg.*, Sudan, Eritrea, Abyssinia.

Var. **megalosperma,** *Müll. Arg.*, S. Tropical Africa—Lower Guinea to Rhodesia and Mozambique.

Var. **benguelensis,** *Müll. Arg.*, N. Nigeria—Nupe, Jeba, Spanish Guinea, Benguella and Mossammedes.

The leaves are applied to women's breasts to increase the flow of milk in Loanda (Hiern, Cat. Welw. Afr. Pl. iv. p. 983), crushed with water as a poultice in Kordofan (Anderson, Wellcome Chem. Res. Lab. Khartoum, 3rd Rep. 1908, p. 298); used medicinally in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 133) and in French Guinea (Pobéguin, Pl. Méd. du Guin. Franç. in L'Agric. prat pays chauds, xi. 1, 1911, p. 490). They are the food of the "Eri" Silkworm (*Attacus ricini*) in the Philippine Islands (Cox, 12th Ann. Rep. Bureau of Science, Philippine Is. 1913, p. 25; Bull. Imp. Inst. 1912, p. 337), in Assam (l.c. 1915, p. 653) and in Trinidad, where the "Eri" Silkworm has been imported and recommended as more suitable for the purposes of a local industry than the "Mulberry" Silkworm (*Bombyx Mori*) (l.c. 1916, p. 13).

The more important use, however, is for the "Castor Oil" which is well known for its medicinal value—that is the first quality or "cold drawn,"—and as a lubricant for machinery. Recently it has come into prominence for lubricating aeroplane engines. It is also used in connection with the dyeing and printing of cotton goods, in the manufacture of so-called glycerine soap and the preparation of fly-papers (Year Book, U.S. Dept. Agric. 1904, p. 290), for dressing sores on camels, by Hausas in Nigeria (Dalziel, Hausa Bot. Voc. p. 107), for the mixing of the colours in Chinese seals (Hosie, Rep. Ssŭchuan, China, No. 5, 1904, p. 34) and for making red pigment for seals, N. Formosa (Walters, Mus. Kew).

The cake after extraction of the oil is not suitable for cattle feeding and is generally used as manure.

Messrs. Rose Downs & Thompson Ltd. of London and Hull, the oldest and largest makers of machinery for treating castor

seed have supplied the Director with the following particulars as to the method of extraction.

The Castor Seed is fed whole, without any preliminary grinding, direct into the press and treated at ordinary atmospheric temperature thus producing the first quality of cold drawn oil. The cakes made in this first pressing, after the oil has ceased to flow, are taken from the press and reduced to meal, which goes back to the Kettle, and for this second pressing steam is admitted to the steam chamber or jacket of the Kettle, provision also being made to admit a small portion of live steam to the interior cf the Kettle should this be necessary in order to enable the remainder of the oil to flow more readily. This second pressing is carried out with the material heated to a temperature of about 180° F. There is another quality of oil also produced, by pressing the seed at a temperature of about 90° F. When treating the seed at ordinary atmospheric temperature the percentage of oil remaining in the cakes would be from 18–20 per cent. when the seed is heated up to a temperature of 90° the oil remaining in the cakes would be got down to about 10–12 per cent.; but in pressing in this way the oil would be somewhat discoloured instead of being practically white as when pressing cold. All three of these qualities of oil are passed through a filter press with an admixture of Fullers-earth.

The presses which are employed for the treatment of Castor Seed are known as the "Premier" type, the pressing boxes being perforated over their entire circumference with minute holes for the escape of the oil; the larger presses being constructed for a working pressure of 3 tons per square inch, the smaller presses for 2 tons per square inch.

A perennial, 5–10 ft. and upwards, sometimes cultivated as an annual; the cultivation is comparatively easy. Seeds may be sown on well prepared ground at distances of about 6 ft., they germinate quickly and the plants come to maturity in about 6 months. It is recommended to encourage branching, to pinch out the top of the main stem when a foot or two high. The seeds are gathered by cutting off the spikes when fully developed; but before the capsules open and completing the ripening under cover. Dry or well drained soils are suitable; but the plant seems to thrive in almost any situation in a tropical climate with a moderate rainfall.

In Nigeria, commonly planted in compounds or growing in waste places (Dalziel, Hausa Bot. Voc. p. 107). In 1905, it was proposed to plant up some acres at Onitsha for the purpose of extracting the oil from the seeds and arrangements were being made to get several varieties of seed and to select from them the best kind, when it was suggested oil-pressing plant would be introduced (Thompson, Rep. Govt. Plantation at Onitsha S. Nig. Govt. Gaz., July 21st, 1905, p. 390). In 1906 it was reported that the variety grown in the Oka district is the most suitable for cultivation at Onitsha, considering yield per acre, size and

quality of the seed (Col. Rep. Ann. No. 512, 1906 (for 1905) p. 26). A good yield would be about 500 lb. or more per acre of seed giving upwards of 50 per cent. of oil.

In 1917 there were 3,474 tons of oil value £219,373 imported into this country chiefly from British India (2,962 tons) Java (450 tons) France (28 tons) (Trade of the United Kingdom, i. 1918, p. 174) and in the same year 898,557 cwt. of seed, value £1,281,075, chiefly from British India (866,603 cwt.) and Brazil (11,463 cwt.). It is interesting to note that in 1913—as showing the increase in value—1,205,537 cwts. value £710,587 were imported (l.c. p. 189). Castor oil is quoted (June 1919) at £96 per ton for pharmaceutical quality, £93 for first pressing and £91 per ton for second pressing, naked in ton lots, deliveries under one ton 10*s*. extra (Chem. & Druggist, June 7th, 1919, p. 583).

Ref.—" Semen Ricini," in Pharmacographia, Flückiger & Hanbury, pp. 567–571.——" *Ricinus communis*," in Med. Pl. Bentley & Trimen, No. 237, 5 pp.——" Castor Oil Plant or Palma Christi," in Cultural Industries for Queensland, Bernays, pp. 29–34 (Govt. Printer, Brisbane, 1883).——Castor Oil, Handbook No. 20, 1893, Imp. Inst. Series, pp. 1–57.——Report on the Castor Oils in the Indian Section of the Imperial Institute, Deering & Redwood, Agric. Ledger, No. 17, 1894, pp. 1–5.——The Castor Oil Plant, Shin, U.S. Dept. Agric. Misc. Circ. No. 1, 1897, pp. 1–4.——" Le Ricin : Botanique, Culture, Industrie et Commerce," Dubard & Eberhardt, in L'Agric. prat. pays chauds, i. 1901–02, pp. 313–326; pp. 493–520; pp. 616–635; pp. 729–746, with Index Bibliographique, pp. 745–746.——" Note sur la Culture du Ricin en Algérie," Rivière, l.c. pp. 747–751.——" Sur deux Formes de Ricin Cultivées en Abyssinie," Dubard & Eberhardt, l.c. iii. 1903–04, pp. 488–490.——" Castor Oil," in Report of the Controller, Exp. St. Peradeniya, Roy. Bot. Gdn. Ceylon, Circ. No. 18, Aug. 1904, pp. 263–269.——" Castor Oil Bush," Burtt Davy, in Transvaal Agric. Journ. iii. 1904, pp. 271–280.——" Castor Oil Plant," Queensland Agric. Journ. xiv. April 1904, pp. 284–285; Extract in Agric. News Barbados, June 18th, 1904, p. 203.——" The Castor Oil Industry," Daugherty, U.S. Dept. Agric. Year Book, 1904, pp. 287–298.——" Le Ricin," in Pl. Utile du Congo, De Wildeman, iii. Art. xxxiv. pp. 588–616 (Bruxelles, 1905).——" The Cultivation of the Castor Oil Plant," Ercole, in Agric. Gaz. N.S. Wales, xvii. 1906, pp. 173–177.——" Castor Oil and Ground Nut Oil from S. Rhodesia," Bull. Imp. Inst. iv. 1906, pp. 97–98.——" Culture du Ricin et Extraction de l'Huile au Tonkin," Dubard & Eberhardt, in L'Agric. prat. pays chauds, vii. 1907, pp. 345–352.——" Castor Bean," Wilcox, in Cycl. American Agric. Bailey, ii. pp. 229–231.——" *Ricinus communis*," in Comm. Prod. India, Watt, pp. 915–923 (John Murray, London, 1908).——" The World's Production of Castor Seed," Journ. Jamaica Agric. Soc. xv. July 1911, pp. 296–303.——" The Cultivation, Production, Preparation and Utilisation of Castor Seed," Bull. Imp. Inst.

ix. 1911, pp. 17–35.——"Castor Seed," l.c. xi. 1913, pp. 57–58, from Anglo-Egyptian Sudan.——"The Cultivation of Castor Oil Beans," Mundy, in Rhodesian Agric. Journ. xi. 1914, pp. 529–533. ——"Castor Seed," Col. Rep. Misc. No. 88, 1914, pp. 504–509, from Uganda, Sudan, East Africa, Rhodesia, Mozambique, Mauritius, Ceylon, and Fiji, with analyses and descriptions.——"Castor Seed," Bull. Imp. Inst. xv. 1917, pp. 407–413.——"Castor Bean Meal Feed for Pigs," Journ. Bd. Agric. xxiv. March 1918, pp. 1444–1446.

PLUKENETIA, Linn.

Plukenetia conophora, *Müll. Arg.*; Fl. Trop. Afr. VI. Sect. 1, p. 949.

Ill.—Tropenpflanz. 1909, p. 282 (nuts).

Vernac. names.—Ngart (Cameroons, *Krause & Diesselhorst*); Awusa, or Owusia, Musyabassa (Sierra Leone, *Scott Elliot*).

Modakeke (Foster, No. 205, Herb. Kew), Oban (Talbot) Akwa (Thomas) in Southern Provinces, Nigeria, and occurring in Upper Guinea from Sierra Leone to Fernando Po and the Cameroons, also in the Gaboon, Belgian Congo, &c.

The leaves are eaten with rice by the natives, Sierra Leone where the plant is often cultivated (Scott Elliot, Col. Rep. Misc. No. 3, 1893, pp. 42, 43).

The kernels yield an oil found to contain no harmful substances; the kernels without the shells weigh 4–5 grams and give 53·8 per cent. of a drying oil, resembling linseed oil in its physical and chemical properties (Tropenpfl. 1909, p. 282, 1912, p. 265; Bull. Imp. Inst. 1912, p. 494, 1913, p. 158; Inter. Inst. Agric. Rome, Bull. Bur. Agric. Intell. Feb. 1918—Ngart (*Plukenetia conophora*), p. 151; Agric. News, Barbados, *seq.*).

A climbing plant 15–20 ft. high Cameroons (Mann, Herb. Kew).

Ref.—"Untersuchung des Öles von *Plukenetia conophora*," Krausse & Diesselhorst, in Der Tropenpflanzer, xiii. 1909, p. 282.—Öl von *Plukenetia conophora*," l.c. xvi. 1912, p. 265. ——"Source of a Useful Oil," Agric. News, Barbados, xi. 1912, p. 201.

PYCNOCOMA, Benth.

Pycnocoma macrophylla, *Benth.*; Fl. Trop. Afr. VI. Sect. 1, p. 959.

Vernac. name.—Boomah (Natal, *Holmes*).

Oban (Talbot No. 699, Herb. Kew) and known from the Cameroons, Belgian Congo, Natal, etc.

Fruits used for tanning in Natal—from whence there is in the Museum a specimen of leather tanned with this material; but they do not appear to be of any importance elsewhere for this purpose.

A shrub 8 ft. high.

Ref.—"Boomah Nuts," Holmes, in Pharm. Journn. [3] viii. 1877, p. 363.

HURA, Linn.

Hura crepitans, *Linn.*; Fl. Trop. Afr. VI. Sect. 1, p. 1019.

Ill.—Commelin, Hort. Med. Amstel. Pl. t. 66 (*H. americana*); Linne, Hort. Cliff. t. 34; Lam. Encycl. t. 793; Dict. Sc. Nat. t. 279; Desc. Ant. ii. t. 124; Tussac. Ant. iv. t. 5; Spach, Suites (Hist. Nat. des Vegetaux) t. 76, f. 2; Baillon, Etude Euphorb. t. 6, ff. 21–35; Martius, Fl. Bras. xi. pt. 2, t. 86; Shattuck, Bahama Is. t. 36; Ann. Inst. Col. Marseille, iii. 1905, tt. 1–3.

Vernac. names.—Sablier elastique (Brazil, *Lamarck*); Sablier (Antilles, *Descourtilez*, *Tussac*); Arbre au diable (Antilles, *Descourtilez*).—Sandbox Tree, Poison Tree (Bd. of Trade Journ. Nov. 24th, 1910, p. 366).

Native of Tropical America: introduced to West Africa Ivory Coast, Gold Coast, Nigeria, Cameroons, etc. and commonly in the Tropics generally. Introduced into India from Jamaica (Watt, Dict. Econ. Prod. India).

The fruit after being boiled in oil and pierced with small holes is often used in the French Colonies as a sand-box for dusting sand on writing—a substitute for blotting-paper (hence the common name). The seeds are used in Mexico as a purgative and the latex is employed as a fish-poison; other medicinal uses are attributed to the seeds and leaves in French Guiana (Heckel, Ann. Inst. Col. Marseille, iv. 1897, p. 142). Crepitin, the toxic albuminoid in the juice has been found by intravenous injection —1 mgm. for 100 kg. body weight—to cause death in dogs after 3 days (Pharm. Journ. [4] xxx. 1910, p. 571); and the juice is said to cause blindness (Agric. News, Barbados, March 12, 1904, p. 82).

An extract from the bark has been recommended as a cure for leprosy (Planchon & Collin, Drog. Simpl. i. p. 341).

The tree which grows to a height of 50–80 ft. is grown as a shade tree at Oloke-Meji and plants raised in the gardens were being planted (1908) extensively in the streets and railway stations (Kew. Bull. 1908, p. 201), in Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 315) and it is commonly grown in the Tropics for ornamental purposes.

Ref.—Étude Morphologique et Anatomique du Sablier (*Hura crepitans*), Gilles, in Ann. l'Inst. Col. Marseille, 2nd series, iii. 1905, pp. 41–120, ff. 1–72, pl. i. (tree), ii. (bark).

ULMACEAE.

CELTIS, Linn.

Celtis Durandii, *Engl.*; Fl. Trop. Afr. VI. Sect. 2, p. 4.

Cameroons, Congo, Angola, East Africa, and (var. *ugandensis*, Rendle) in Uganda. A tall deciduous tree.

Celtis integrifolia, *Lam.*; Fl. Trop. Afr. VI. Sect. 2, p. 7.

Vernac. names.—Dukki or Dunki (Hausa, *Dalziel*); Zuwoh (Katagum, *Dalziel*); Mahagai-a, Lebinga (Arabic,—Kordofan, Blue Nile, *Muriel*).

Borgu, Yola, Katagum and widely distributed in Upper Guinea and Nile region, also in Arabia.

Leaves used as fodder and as a pot-herb, Yola (Dalziel No. 152, Herb. Kew); fruits edible, Borgu (Barter, No. 772, Herb. Kew). Wood very perishable, Blue Nile (Muriel, No. 71, Herb. Kew).

A low tree, banks of Guarara River (Elliott, Herb. Kew); a tree, 40 ft., Borgu (Barter), 40 ft. and well known all over N. Nigeria (Dalziel) stem much branched, buttressed, growing on ground inundated at high Nile (Muriel).

Celtis Soyauxii, *Engl.*; Fl. Trop. Afr. VI. Sect. 2, p. 5.

Ill.—Mildbraed, Wiss. Ergebn. Deutsch. Zentr.—Afr. Exped. t. 16c (*C. Mildbraedii*).

Vernac. name.—Cabende (Angola, *Gossweiler*).

Cameroons, Ivory Coast, Uganda, Angola, East Africa, Congo and Natal.

The dead wood has a fœtid odour. A tree 50–100 ft.

Celtis Zenkeri, *Engl.*; Fl. Trop. Afr. VI. Sect. 2, p. 6.

Vernac. names.—Ita (Lagos, *Punch*); M'piwere (Mabira Forest, *Dawe*); Cabende (Angola, *Gossweiler*); Pao Cababa or Quibaba (Golungo Alto, *Welwitsch*).

Lagos (Punch, No. 108, 1901, Herb. Kew), Aladin, S. Nigeria (Foster, No. 194, Herb. Kew); Idah District (Kitson) and between Garua & Golombe (Talbot) in Nigeria; also in the Cameroons, Uganda, Angola, Belgian Congo and East Africa.

Fruit is a small red drupe about the size of a currant, watery; wood white, hard; but perishable and attacked by insects, Lagos (Punch, l.c.); wood pale-yellow in colour, of good strength and texture, but not obtainable in large sizes (Foster, Nig. Trees & Pl. *Celtis* sp. p. 62); timber whitish throughout, not durable, Angola (Gossweiler, Fl. Trop. Afr. l.c.); whitish, straight, strong, very useful, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iv. p. 1028); a valuable timber tree, Mabira Forest (Dawe, No. 173, Herb. Kew; Rep. Bot. Miss. Uganda, 1906, *C. Soyauxii*, Engl. p. 56) and affording hard wood, Budongo Forest (Dawe, No. 833, Herb. Kew).

A large deciduous tree 40–80 ft. or more high.

TREMA, Lour.

Trema guineensis, *Ficalho*; Fl. Trop. Afr. VI. Sect. 2, p. 11.

Ill.—Thonner, Blütenpfl. Afr. t. 30; Engl. & Drude, Veg. Erde, ix. f. 541; De Wildeman, Etudes Fl. Bangala, p. 19; Bull. Soc. Bot. Belgique, li. 1912, t. 35.

Vernac. names.—Afoforo Afe (Lagos, *Foster*); Afoforo (Lagos, *Punch*); Tengbu (Sierra Leone, *Scott Elliot*); Nanujiu rinkia (Katagum, *Dalziel*); Mpeva (Nyasaland, *Purves*); Cabra (St. Thomé, *Welwitsch*); Musamba-Samba (Cazengo, *Welwitsch*); Ecekou (Congo, *De Wildeman*); Charcoal Tree (Nyasaland, *Purves*).

Lagos, Nupe, Katagum and widely distributed in Upper Guinea from Senegal to the Cameroons; in Angola, Belgian Congo, East Africa, etc. and in Natal and Madagascar.

Small pieces of wood roasted and made into tea for dysentery. Lagos (Punch, Herb. Kew); bark used for coughs, Sierra Leone (Scott Elliot, Herb. Kew); musical instrument called "Samba, viola," made from the wood, Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 1030); wood used for various building purposes, Isle of St. Thomas (l.c.); wood soft and light and of little use except for fuel, Nyasaland (Purves, Bull. Imp. Inst. 1909, p. 59).

A shrub or small tree, 10–20 ft.; berries, small black; common in cultivated fields, Abinsi and vicinity (Dalziel, Herb. Kew); common on abandoned land, Gold Coast (Chipp, Herb. Kew), small tree of very rapid growth, Uganda (Dawe, Herb. Kew); a low-spreading evergreen, an exceedingly fast grower, affording excellent shade, Nyasaland (Purves, l.c.).

CANNABINACEAE.

CANNABIS, Tourn.

Cannabis sativa, *Linn.*; Fl. Trop. Afr. VI. Sect. 2, p. 16.

Ill.—Numerous works from an early date, one of the earliest being Rheede, Hort. Mal. (1690) x. t. 60–61 and of the most modern, Duthie, Field Crops (1882) i. tt. 19, 20, Bentley & Trimen, Med. Pl. (1880) t. 231; Prain, Sci. Mem. Med. & San. Dept. India, No. 12, 1904, tt. 1–5.

Vernac. names.—Dagga (Transvaal, *Burtt-Davy*); Riamba, Diambe or Jamba (West Africa, *Watt*); Bhang (East Africa, *Speke & Grant*); Gunga (E. Nepal, *Hooker*); Ganja (Bengal, *Kerr, Prain, Watt*); Liamba (West Africa, *Negreiros*); Bangue (E. Africa, *Negreiros*); Riamba, Riambe, Diambe or Liambe (Angola, *Welwitsch*); Canhamo (Portuguese, *Welwitsch*); Diamba (Gaboon, St. Paul de Loanda, *Mann*): Kief (Morocco, *Maw*); Tabaca bianca, Jamba (Lower Amazon, *Traill*); Hon-ma (Szechuan, *Wilson*); Tangma (Hupeh, *Wilson*); Haschisch (Egypt, Bd. of Trade Journ. July 25th, 1912, p. 236); Hasheesh (Arabian, *Orme*); Dakka, Insanga (Natal, *Ferneyhough*); Insanga (B. C. Africa, *Bowhill*); Maconia (Congo, *Clarke*). Hemp, European Hemp, Common Hemp, Indian Hemp.

A plant widely distributed, wild and cultivated, in many tropical, sub-tropical and temperate countries in Asia, Africa, America, Europe and Australia.

Broadly it is cultivated in hot countries as a drug and in cool countries as a fibre plant. The seed produced in many of

the countries where the plant is grown for fibre—Russia and Central Europe chiefly, is a well-known food for birds, poultry, etc. and yield on expression an oil used for burning and in the manufacture of soft-soap. The oil-cake is used for feeding stock.

India is the principal source of the drug; but recently some packages of "American cannabinus," grown in the Carolina Drug Gardens were put on the London Market with a report and analysis to the effect that there was "no difference between this Oleo Resin and that from ordinary Cannabis Indica" (Mus. Kew). The drug is strongly narcotic and it appears in three forms "Bhang"—dried leaves and flowering shoots. "Charas"—a resinous substance and "Ganja"—the dried flowering tops of the cultivated female plant. The cultivation and sale in India is carried on under license (Watt. Comm. Prod. India) and legal restrictions exist in many other countries—Nigeria (Col. Rep. Ann. No. 821, 1914, p. 6; No. 825, 1913, p. 19—Opium and Similar Drugs), Sierra Leone (Gazette, June 5th, 1920), East Africa Protectorate under "Abuse of Opiates Ordinance 1913," declaring it illegal to sow, cultivate or otherwise grow Indian Hemp in the Protectorate (Col. Rep. Ann. No. 840, 1915, p. 44), in British Guiana the importation of Indian Hemp, including ganja, bhang and charas is forbidden except under license and only 4 oz. can be sold to one person at a time within seven days (Col. Rep. Ann. No. 833, 1915, p. 20); the cultivation of "Dagga" is prohibited at the Cape (Pharm. Journ. [4] xxv. 1907, p. 493) and in Angola some of the natives cultivate the plant in concealed places (Hiern, Cat. Welw. Afr. Pl. i. p. 995). Other instances of official control might be given; but the above may be sufficient to show that cultivation is more or less inadvisable. In nearly all parts of Africa the leaves are prepared for smoking by the natives with very demoralising effects. In the Museum at Kew there are various samples as evidence of its use in many parts including "Tangier Smoking Mixture," composed chiefly of Hemp, as sold in the Moorish shops (Balfour, 1896), the drug as used for smoking, W. Africa (Monteiro), "Diamba" as it is sold at Gaboon (Mann, 1861), "Bangy" or "Hemp," from Mozambique (Taylor & Co. 1906), etc. The importance of the plant as a fibre producer is without question; but its place in this respect may be readily taken by fibre plants perhaps equally valuable and better suited to the climate.

There is a considerable literature of which the following are but a few of recent date and in the Museum at Kew there is a wide selection of specimens including, fibre, seed and drug.

Ref.—"Indian Hemp: How it is Grown and prepared for use in Medicine and as a Stimulant," Mair, in Chemist & Druggist, July 30th, 1898, pp. 166–168.——"Morphology, Teratology and Diclinism of the Flowers of *Cannabis sativa*," Prain, in Sci. Mem. Med. and San. Dept. India, No. 12, 1904, pp. 1–32.——"Note on Cannabis Indica," Holmes, in Pharm.

Journ. [4] xx. 1905, pp. 550–551.——"*Cannabis sativa,*" in Comm. Prod. India, Watt, pp. 249–263.——"Cultivation, Preparation and Utilisation of Hemp and Hemp Seed (*Cannabis sativa*)," in Bull. Imp. Inst. x. 1912, pp. 94–111.——"Hasheesh and Cannabinomania," Orme, in British North Borneo Herald, Dec. 16th, 1915.——"Hemp," in Cotton & other-Vegetable Fibres, Goulding, pp. 113–122 (John Murray, London, 1917).

MORACEAE.

Morus, Linn.

Morus mesozygia, *Stapf*; Fl. Trop. Afr. VI. Sect. 2, p. 21.

Vernac. name.—Wonton (Ashanti, *Thompson*).

Lagos, and also found in Senegal, Ivory Coast, Gold Coast, Togoland.

A small tree, Ogbomoshaw, Lagos (Rowland, Herb. Kew); cultivated by the Ashantis as a shade tree (Thompson, Herb. Kew); planted as a palaver tree in many villages in the Ivory Coast and in Lagos; introduced to Senegal (Chevalier, Bull. Soc. Nat. Accl. Franç. 1912, p. 315).

Morus indica, Linn., a shrub or small tree, and *M. nigra,* Linn. "Black Mulberry," a deciduous tree about 30 ft. high, are mentioned in Flora of Tropical Africa (l.c. p. 20) as occurring in Africa, the former in British East Africa, Zanzibar, Usambara, Portuguese East Africa and the Zambesi Delta; cultivated in India, China, Japan and East Africa and the latter in Angola, cultivated in Gardens. The general areas of cultivation of these trees including *M. alba,* Linn. are, in hot countries, at comparatively high altitudes, ranging from about 4000–11,000 ft.—the altitude of an estate in the Nyonda River Valley, British East Africa, where among other fruits of temperate climates, the "Large Black English" and "Russian" Mulberry is being grown, is about 5500–6000 ft. (Kew Bull. 1914, p. 272). In Nyasaland (1916) 2500 mulberry plants were raised from cuttings in the Nursery at Zomba, for the purpose of establishing small groves on the Government Farms and other places in the Protectorate, with a view to silk-worm culture, provided certain experiments then being made proved successful (Purves, Report of the Forestry Division, to Director of Agric. Nyasaland for 1916, p. 14).

Chlorophora, Gaudich.

Chlorophora excelsa, *Benth. & Hook.*; Fl. Trop. Afr. VI. Sect. 2, p. 22.

Ill.—Trans. Linn. Soc. xxvii. (1871) t. 23 (*Morus excelsa*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 72 (*Milicia africana*); Thompson, Col. Rep. Misc. No. 66, 1910, t. 23; Engl. & Drude, Veg. Erde, ix. p. 280, f. 249; Dudgeon, Agric. & For. Prod. W. Afr. p. 91, f. 24; Unwin, Rep. Affor. Togoland, 1912, p. 25, f. 48 (tree 10 years old, Pfanda Dist. Plantations); Dixon, Proc.

Roy. Dublin Soc. xv. 1918, t. 36, ff. 88, 89, 90 (Photo-micrographs of wood x. 31).

Vernac. names.—Iroko (Yoruba, *Moloney*, *Thompson*, *Foster*, *Unwin*, *Dalziel*, *Barter*); Tema, Sime (Sierra Leone, *Unwin*); Kusaba (Gold Coast, *Rothschild*); Loko (Hausa, *Dalziel*); Oroko or Oloko (Benin, *Thompson*, *Foster*); Reko Zhiko (N. Nigeria, *Yates*); Momangi (Cameroons, *Busse*); Muvule (Uganda, *Dawe*, *Brown*); Odum (Gold Coast, *Thompson*); Mgunde or Magundo (Port. E. Africa, *Sim*); Camba-camba, Mucamba-camba Amoreira, Moreira (Golungo Alto, *Welwitsch*); Amoreira (St. Thomas, *Johnson*); Dou, Akede, Elwi (Ivory Coast, *Courtet*); Molongo (Congo, *De Wildeman*); Rokko (Dahomey, *Courtet*).—Coke wood (*Courtet*); Rock Elm (Thompson, List For. Trees. S. Nig. 1910, p. 7); West African Mulberry; Swamp Mahogany.

Lagos, Cameroons, N. Nigeria (Agaie, Yates, No. 20, Herb. Kew) and Gold Coast, Sierra Leone, Togoland, Uganda, Gaboon. Angola, Belgian Congo, East Africa, Zanzibar, &c.

Wood largely used for building purposes; window frames, shutters, doors, furniture, verandahs, fences and shingles are made from it in West Africa (Kew Bull. 1891, p. 43); used for sleepers, planks, doors, tables, benches and furniture in Nigeria (Thompson, l.c.), the only kind used in house building, durable and resists the attacks of ants better than any other; much valued on the Coast (Barter, No. 3330 (1859) Herb. Kew); durable and ant-proof and fairly easily worked; so regularly sound in large sizes that all the larger dug-out boats are made of it, Port. E. Africa (Sim, For. Fl. & For. Res. Port. E. Afr. p. 118); used for house-building, gates, doors, tables, &c., Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 1026); used for railway construction, joinery, etc., Ivory Coast (Courtet, L'Agric. prat. pays chauds, x. 1910, p. 462); weight about 50 lb. per cubic ft. (Sim, l.c.), density 0·721 (Courtet, l.c.), will not float in the green state (Foster, Nig. Trees & Pl. p. 63) and a specimen in the Kew Museum (Dawe, No. 689, Uganda) has specific gravity 0·673 = 42 lb. per cubic ft. Of this specimen it has been reported "weight per cubic ft. 46 lb., a rather coarse-grained wood of uniform yellowish colour with pretty zigzag markings on a tangential section. It can scarcely be said to be ornamental and is of little, if any, value for export; the heartwood is irregular in shape and the sapwood from $1\frac{3}{4}$–$2\frac{1}{4}$ in. thick; it is doubtless a useful wood for building purposes; it will not take nails, being fissile, is hard to saw, planes fairly easily, but the grain rips out; turns easily, but finishes badly (Mus. Kew: Report by Herbert Stone for Imp. Institute).

This tree is reported amongst others to be tapped for the latex to mix with that of *Funtumia* (Thompson, Col. Rep. Misc. No. 66, 1910, p. 47). Deposits of "Carbonate of lime" are often found in the trunks of trees that have become hollow or fissured by some agency, probably lightning or other powerful cause.

There is a specimen of deposit from the Gold Coast (W. Soward, 1914) in the Museum at Kew.

A tree, 60–80 ft., before branching, base sometimes buttressed, deciduous for a short time during the dry season, common in the Yoruba forests (Barter, l.c.); 40–60 ft. Agaie, N. Nigeria, seldom growing beyond edge of forest along stream, flowering in February (Yates, No. 20, Herb. Kew); 15–30 metres, Gaboon (Klaine, Herb. Kew); a tree growing in the Mamu Reserve measured 24 ft. girth at 10 ft. from the ground, height 190 ft. (Thompson, Rep. on Visit to Mamu Reserve, 1911, p. 5); found in the older forests, Gold Coast (Col. Rep. Misc. No. 66, 1910, p. 20), and in the Ahoada District, Southern Provinces, Nigeria the tree is grown for marking the boundaries between the different farms and villages (Ann. Rep. Forestry Dept. S. Nig. 1911, p. 3). In 1905 plantations of the tree were in course of development in the various Forest Reserves (*see* p. 41 of this work) and in the vicinity of the railway, Lagos (Col. Rep. Ann. No. 507, 1906 (for 1905) p. 25) and in general owing to the increasing demand for local purposes it was considered advisable to increase the planting (Col. Rep. Misc. No. 51, 1908 (for 1906) p. 21). In the Oloke-Meji forest—quarter ending Sept. 1907, 1400 plants were put out (Farquhar, Govt. Gaz. S. Nig. April 15th, 1908, p. 5) 16,710 seedlings are reported to have been put out in 1908 (Col. Rep. Ann. No. 630, 1909 (for 1908) p. 14) and 8000 in 1910, when in the Mamu Reserve, 2438 were planted out (Col. Rep. Ann. No. 695, 1911 (for 1910) p. 11) and the railway plantation (W. Prov.) was extended by 12 acres containing 8000 seedlings (l.c. p. 12).

Ref.—" Report on the Railway Iroko (*Chlorophora excelsa*) Plantation " Unwin, in Govt. Gaz. S. Nigeria, Suppl. No. 47, June 1st, 1910, pp. 1–3.——" Iroko," in Report on the Afforestation of Togo, Unwin, pp. 37–38 (Waterlow & Sons, Ltd. London, 1912).——" *Chlorophora excelsa*," Dixon, in The Sci. Proc. Roy. Dublin Soc. xv. Dec. 1918, p. 469; description of wood (Dawe, No. 151, Uganda, 1905, Mus. Kew).

FICUS, Linn.

Ficus Anomani, *Hutchinson*; Fl. Trop. Afr. VI. Sect. 2, p. 157.

Vernac. name.—Anomani (Gold Coast, *Armitage*).

Cameroons, Sierra Leone, Ivory Coast and Gold Coast.

Extract used as bird-lime for catching parrots, Gold Coast (Armitage, Report, Rubber Trees and Vines, Encl. in Letter Col. Office to Director, Kew, Nov. 30th, 1898).

An epiphyte; common everywhere (l.c.).

Ficus asperifolia, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 111.

Ill.—Hooker, London Journ. Bot. vii. 1848, t. 15 B.

Vernac. name.—Epin or Epindo (Yoruba, *Foster*).

Abo, Nupe, in Nigeria and also Gold Coast, Sierra Leone, Cameroons, Belgian Congo.

Of little importance: but the leaves because of their scabrid surfaces are used as sand-paper like those of *F. exasperata* (*q.v.*) with which it has sometimes been confused. Ashes sometimes used with the native dye "Elu" (*Lonchocarpus cyanescens*—*see* p. 244) when the ashes of the wood of "Ayin" (*Anogeissus leiocarpus*—*see* p. 309) are not available (Foster, Nig. Trees & Pl. p. 64).

A shrub about 8 ft. high; riverside everywhere, Nupe (Barter, Herb. Kew): small tree, riverside—Tano River, Gold Coast (Chipp, Herb. Kew).

Ficus Barteri, *Sprague;* Fl. Trop. Afr. VI. Sect. 2, p. 205.

Eppah, Onitsha (Barter), Bonny (Kalbreyer), Old Calabar (Holland) in Nigeria, and known also from Liberia, Dahomey, Spanish Guinea and Belgian Congo.

Fruits edible—orange coloured, Eppah (Barter, No. 3311, Herb. Kew: Sprague, Gard. Chron. June 6th, 1903, p. 354); produces good rubber according to Sim, Liberia (Johnston, Liberia, ii. p. 652); but probably the plant is of more value for decorative purposes for which the long narrow acute leaves by comparison with those of larger foliage, eminently fit it.

A small shrub, 8 ft. in wet places, Eppah (Barter, Herb. Kew), found as an epiphyte or as recorded by Kalbreyer (No. 79, Herb. Kew) a half tree 15–25 ft. high, at Bonny.

Ficus capensis, *Thunb.*; Fl. Trop. Afr. VI. Sect. 2, p. 101.

Ill.—Hook. Lond. Journ. Bot. vii. 1848, t. 3, f. B (*Sycomorus capensis*); t. 14 f. A (*S. Thonningii*); f. B (*S. guineensis*); Warburg & De Wildeman, Ficus Fl. Congo, t. 6 (*F. erubescens*); t. 17 (*F. Munsae*).

Vernac. names.—Opoto (Lagos, *Dodd*, *Macgregor*, *Dawodu*); Opoto (Ilorin, *Millson*); Awkpawtaw (Yoruba, *Millson*); Beru (Katagum, *Dalziel*); Uwar Yara (Hausa-Kano, Katagum, Abinsi, *Dalziel*); M'Koongen or M'Kookoo (Madi, *Grant*); Gassé, Ngab (Bahr-el-Ghazal, Sudan, *Broun*).

Lagos, Ilorin, Katagum, Abinsi in Nigeria and distributed in Upper Guinea from Senegambia to the Cameroons: also found in the French Congo, Belgian Congo, Angola, Uganda, East Africa, Zanzibar, Rhodesia, South Africa and Cape Verde Islands.

Figs edible (Dalziel, Hausa Bot. Voc. p. 99); used as an article of food in a raw state, flavour agreeable and almost equal to ordinary fig, yellow when ripe, very plentiful but not cultivated (Millson, Kew Bull. 1891, p. 219); eaten by the natives and colonial travellers, juicy, taste not unpleasant but a little watery, the skin resinous and very bitter, yellow-red when ripe (Hiern, Cat. Welw. Afr. Pl. i. p. 1012, *F. Sycomorus* and vars.); green pigeons are fond of the figs, Madi (Speke & Grant, Herb. Kew); recorded as edible, Bahr-el-Ghazal (Broun, Herb. Kew).

A shrub or small tree; very ornamental 20–35 ft. high, trunk not rarely decked up to the height of a man with 5–12 pendulous panicles, all laden with bright rosy receptacles, 60–80 in some panicles and thus presenting an aspect of the highest fruitfulness, Angola (Hiern, l.c.); a tree by water-courses, Katagum; figs in abundant branched clusters on the old wood (Dalziel, Herb. Kew). The receptacles are variously described as about $\frac{1}{4}$ in. long (Hiern, l.c.); $\frac{3}{4}$–1 in. long (Fl. Trop. Afr. l.c.) and nearly the size of a walnut, ripe in October at 7° 21′ S. lat. (Speke & Grant, Herb. Kew).

Ficus capreaefolia, *Del.*; Fl. Trop. Afr. VI. Sect. 2, p. 107.

Ill.—Hook. Lond. Journ. Bot. vii. 1848, t. 5B. (*F. antithetophylla*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 90, f. C (*F. palustris*); Engl. & Drude, Veg. Erde, ix. Part 1, p. 118, f. 100; Warburg & De Wildeman, Ficus Fl. Congo, t. 22.

Vernac. name.—Umbharanta (Chindao, Gazaland, *Swynnerton*).

Nupe, Katagum in Nigeria and also in Togoland, Cameroons, Nile Land, and East Africa.

Leaves used as sand-paper for polishing assegai handles, in Gazaland (Swynnerton, Journ. Linn. Soc. xl. 1911–12, p. 205).

A small shrub, Nupe (Barter, Herb. Kew), a shrub by banks of streams, Katagum (Dalziel, Herb. Kew).

Ficus Carica, *Linn.*, Sp. Pl. (1753) p. 1059.

A deciduous tree, about 20 ft. high. Leaves alternate, cordate 3–5 lobed, scabrous. Fruit a fleshy receptacle—containing within it the male and female flowers—arising in the axils of the leaf. Seeds (achenes) small.

Ill.—Lam. Encycl. t. 861; Linne, Amoenitates Acad. i. t. 2 (seedlings); Gaertn. Fruct. Sem. Pl. ii. t. 91; Schk. Handb. t. 358; Duhamel, Traite des Arbes, iv. tt. 53–59 (fr.); Plenck, Ic. t. 736; Dict. Sc. Nat. t. 285; Hayne, Darst. Beschr. Gewächse, ix. t. 13; Risso, Hist. Nat. Prod. Europ. Merid. ii; Nees von Esenbeck, Plant. Medic. Düsseld. t. 97; Guimpel, Abbild. Beschr. t. 69; Woodville, Med. Bot. iv (1832) t. 244; Stephenson & Churchill, Med. Bot. iii. t. 154; Mag. Bot. & Gard. i (1836) t. 32, f. 1; Gallesio, Pomona, Italy, iv. including "Caprifico" and many cultivated varieties; Burnett, Pl. Util. i. t. 10a; Schnizlein, Ic. t. 92, f. 24 (fr.); Rchb. Ic. Fl. Germ. xii. t. 659; Berg. & Schmidt, Darst. & Beschr. Pharm. iii. t. 19a; Bentl. & Trimen, Med. Pl. t. 228; Zippel, Ausl. Handels Nährpfl. t. 53; Trans. Linn. Soc. iii. (1888) t. 46; Sauvaigo, Les Cult. Medit. p. 225, f. 96; Howard, Year Book, U.S. Dept. Agric. 1900, tt. 1–8; Bailey, Cycl. Hort. (1915) t. 42 ("Celeste" fig tree).

The Fig, Smyrna Fig.

Native of Asia Minor & Syria; cultivated in India, Baluchistan, Afghanistan, Kashmir, S. Europe, N. Africa, America, Persia and many sub-tropical countries.

There appears to be no record of the cultivation in Nigeria. In Sierra Leone the common fig is said to grow well (Col. Rep. Misc. No. 3, 1893, p. 40). In Golungo Alto, Angola it is "cultivated by plant fanciers in various but few places and affords well tasted fruit, but always inferior to that grown in Europe (Hiern, Cat. Welw. Afr. Pl. iv. p. 1008); the "purple" variety is reported to grow well in Dominica, where it is always in season, but less plentiful in April, May and June (Kew Bull. 1888, p. 210). Fairly good fruit is produced in Singapore, where the Chinese frequently grow the green-fruiting fig in pots and good specimens may often be seen bearing a large crop of fruit (Milsum, Dept. Agric. F.M.S. Bull. No. 29, 1919, p. 89). The fig thrives in a variety of climates but the best is probably that approaching sub-tropical, with a moderate rainfall; the soil should be well-drained, fairly rich, with a good proportion of lime rubble, in situations exposed to the sun. In Palestine numerous varieties are said to grow wild abundantly in the crevices of rocks and shading the opening of the numerous mountain caves (Aaronsohn, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 180, 1910, p. 21). The cultivation in Nigeria for export may perhaps be inadvisable, but it is probable the tree might be grown with advantage for local use. There are many varieties grown. The good varieties of table figs, used as soon as possible after ripening, develop sufficiently without caprification; but where figs are dried or preserved for commercial purposes, caprification is essential—fruit growers in California could not produce figs equal to those of Smyrna until the caprifig insect (*Blastophaga grossorum*) was introduced (Howard, Year Book, U.S. Dept. Agric. 1900, p. 80). This insect, male and female, is bred in the receptacles of the wild or "capri-fig" (there are specimens of this fig in the Kew Museum, collected by Sir Jos. Hooker in Smyrna, 1860), from which in due time the female escapes and enters the receptacles, through the orifice at the apex, of the cultivated plant, carrying with it the pollen. In the Orient pollination is provided for by hanging a branch of ripening capri-figs in those of the cultivated trees at the time of flowering. Bailey (Cycl. Amer. Hort. iii. p. 1237) states that only 30 capri-figs are needed to caprify one large fig tree and one tree of the wild fig is sufficient for 100 Smyrna fig trees.

May be propagated by seeds, but the better sorts are usually propagated by cuttings. The Smyrna figs are regarded as the best on the market and the finest varieties grown there are "Sari Lop"—appreciated for its large size and the "Bardajik, a smaller but sweeter and finer flavoured fruit usually eaten in its fresh state—this when dried goes by the name of "Sheker Injir" (sweet fig). Some 30 years ago the acreage planted in Smyrna was about 10,000, giving an average crop of 9,000 tons; at the present time (1920) the orchards cover 25,000 acres, yielding on the average 23,000 tons of figs (Bd. of Trade Journ. Feb. 19th, 1920, p. 265).

Preserved figs and "fig-cake" are imported into the United Kingdom from Turkey, Portugal, Spain, France, Algeria, Greece and the United States.

Ref.—Richerche sulla Natura del Caprifico e del Fico e sulla Caprificazione, Gasparrini, pp. 1–96, pls. i.–viii (Naples, 1845).——"Caricae," in Pharmacographia, Flückiger & Hanbury, pp. 542–544 (Macmillan & Co. London, 1879).——"*Ficus Carica*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 347–349. ——"Fig," in Fruit Growers' Guide, Wright, ii. pp. 170–200 (Virtue & Co. Ltd. London, 1892).——Fig Culture: Edible Figs: Their Culture and Curing, Gustav Eisen, U.S. Dept. Agric. Div. of Pomology, Bull. No. 5, 1897, pp. 1–32, including "Fig Culture in the Gulf States," Earle, pp. 23–32.——"Smyrna Fig Culture in the United States," Howard, in Year Book, U.S. Dept. Agric. 1900, pp. 79–106, illustrated.——The Fig: Its History, Culture and Curing, Gustav Eisen, U.S. Dept. Agric. Div. of Pomology, Bull. No. 9, 1901, pp. 1–317; pls. i.–xv, figs. 91, with a bibliography.——The Fig in Georgia, Starnes, State Coll. Agric., Georgia Exp. St. Bull. No. 61, Nov. 1903, pp. 49–74.——Notes on Fig Cultivation in Southern India, Subba Rao, Dept. of Agric. Madras, Bull. No. 57, 1908, pp. 135–141.——"*Ficus Carica*," in Comm. Prod. India, Watt, pp. 537–538.——"The Pollination of the Smyrna Fig," Agric. News, Barbados, x. Aug. 19th, 1911, p. 266.——The Wild Fig and Its Relation to the Capri-fig and the Cultivated Fig, Tschirch & Ravasini, in Comptes Rendus, clii, 1911, pp. 885–888.——"Caprification of Smyrna Figs," Tribolet, in Agric. Journ. Union South Africa, iii. Feb. 1912, pp. 247–256, illustrated.——Fig Growing in the South Atlantic and Gulf States, Gould, U.S. Dept. Agric. Farmers' Bull. No. 1031, 1919, pp. 1–45.

Ficus discifera, *Warb.*; Fl. Trop. Afr. VI. Sect. 2, p. 196.

Vernac. names.—Wa (Katagum, *Dalziel*); Kaurduk (Nubia, *Broun*).

Katagum, and known from Nubia, Upper Nile and Uganda.

Fruit edible, Katagum (Dalziel, No. 330, Herb. Kew).

A medium sized or large tree.

Ficus dryepondtiana, *Gentil*; Fl. Trop. Afr. VI. Sect. 2, p. 127.

Ill.—Rev. Hort. Belge, 1906, p. 85.

Cameroons, Gaboon, and Belgian Congo.

Leaves used in native medicine as a cure for plague, Belgian Congo (Body, Fl. Trop. Afr. l.c.).

Propagates readily from cuttings, grows quickly and is recommended for outdoor decoration in summer (Gentil. Rev. Hort. Belge, l.c.). The leaves are 9–13 in. long, 3–4 in. broad, dark green above, purple below, in texture chartaceous. Cultivated in the Royal Botanic Gardens at Kew and in the Botanic Garden at Brussels.

Ficus elastica, *Roxb.* Hort. Beng. (1814) p. 65.

A large evergreen tree 100 ft. and upwards, sometimes in the early stages growing as an epiphyte; developing strong aerial roots from the branches and buttress like roots near the base. Leaves elliptic, acuminate, shining, dark green above, lighter beneath, blade upwards of 10 or 12 in., petiole about 1–2 in., stipules large (about 6 in.) colour somewhat pink. Figs about ½ in. long, sessile in the axils of the leaves, greenish-yellow when ripe. Seeds (achenes) small, each fig contains about 75 and in a lb. there are about 270,000 (Kew Bull. 1891, p. 100).

Ill.—Wight, Ic. Pl. Ind. Or. ii. t. 663; L'Hort. Universel, Paris, vi. (1845) p. 108; Griffith, Ic. Pl. Asiatic, t. 59, f. F. (development of organs); Gard. Chron. Sept. 19th, 1874, p. 359, f. 76; Sauvaigo, Les Cult. Medit. p. 62, f. 27; King, Ficus, Ann. Bot. Gard. Calcutta, i. t. 54; Tropenpfl. 1899, p. 423; Revue Cult. Col. viii. 1901, p. 332; Tropenpfl. 1905, p. 441 (trees 5 years old at Tabalong, Borneo); India Rubber Journ. March 12th, 1906, p. 301 (Rambong tree, 48 yards in circumference); Indian Forest Bull. No. 4, 1906, t. 1 (natural grown tree, about 120 ft. high), t. 2 (plantation tree, 55 ft. high, about 15 years old) and in Agric. Journ. India, i. 1906, t. 27; Boll. Ort. Bot. Palermo, v. 1906, t. 1; Yves Henry, Caoutchouc Afr. occid. t. 8 (young plant); L'Agric. prat. pays chauds, viii. 1908, part 1, p. 97 (young plant); Bull. Agric. Congo Belge, i. 1910, p. 256, t. 88 (in plantation, Eala), ii. 1911, p. 509, f. 241 (at Boma).

Vernac. names.—Rambong, Karet (W. Java, *Watt*, *Manson*); Ratte-nooge (Ceylon, *Thwaites*); Rambong (Sumatra, *Witt*); Getah Rambong (Malay, *Fox*, *Murton*); Nyaung Kyetpaung (Burma, *Brandis*).—Assam Rubber, India-Rubber Fig.: Indian Caoutchouc.

Native of Assam: cultivated in India, Ceylon, Java, Sumatra, West Africa and other parts of Tropical Africa, Egypt, Seychelles, &c. West Indies.

This is the main source of Assam Rubber, chiefly from wild plants and before the introduction of Para Rubber also the most important source of rubber from Java and Sumatra, whence at the present day the greater part of the trade supplies come, from both wild and cultivated trees—samples in the Kew Museum of "Java Rubber," Penang Rubber" (Figgis & Co., 1898), "Pamanoekan Balls," Java (Inter. Rubber Exhib. London, 1911) "Ordinary Block Rambong," Delhi Moeda Estate, Sumatra (Inter. Rubber Exhib. London, 1908) and "Laminated Rambong" (*Ibid.*) &c. Plantations were established in Java 1872 and in Assam, 1874 (Watt, Comm. Prod. India, p. 652). Kew has been instrumental in distributing the plant to the tropical Colonies and it is probable that it may now be found more or less widely spread in the Tropics generally. Seed was sent to Lagos direct from India in 1890 (Kew Bull. 1891, p. 97). In 1905 it was being planted at the Onitsha Plantations and reported to be doing well (p. 37 of this work) and in 1908 reported

as doing "excellently at Oloke-Meji where a small plantation exists and it has been distributed to farmers residing in the reserve: the cultivation of this species will be greatly extended next year" (Col. Rep. Ann. No. 507, 1906, Lagos, p. 25). At Old Calabar about 500 plants were in existence in 1897; but none large enough to tap (Ann. Rep. Bot. Gdn. Old Calabar, MSS. for 1897–98). A sample of rubber from the Eastern Province, described as black and sticky externally and deficient in strength, although of satisfactory composition, valued (1909) at about 3*s*. per lb. with fine hard Para at 5*s*. per lb.; with the suggestion that "if the physical properties could be improved it would be of very good quality and would realise a very satisfactory price (Col. Rep. Ann. No. 665, 1911, S. Nig. for 1909, p. 32). Briefly the plant seems to have been readily established in the Colony but it does not seem to have been very successful as a rubber producer. It grows freely enough but in comparison with Para the yield is unsatisfactory and this seems to be the general view. In Assam "it is well known that *Ficus elastica* will grow with undiminished rapidity in situations remote from the hills; but in such localities it fails to yield caoutchouc (Kew Bull. 1896, p. 171) and in 1906, Mann (Agric. Journ. India, i. 1906, p. 398) advises the cultivation as a bye-product to Tea Culture or as a dependent of another larger and more profitable Industry and then only on inferior land. In Sumatra also trees are being cut out on the majority of estates (Akers, India Rubber Journ. March 29th, 1913, p. 18). It is recommended that trees be tapped only once in three years as if tapped yearly they are liable to die (Watt, Comm. Prod. India, p. 653). These facts added to those of the principal requirements—"high or well drained land and a hot steamy climate"—conditions ideal for Para rubber and that the tree does not so readily lend itself to tapping may account for the disfavour into which it appears to have fallen under cultivation.

The tree is one on which the "Lac" Insect (*Tachardia Lacca*, Kerr) feeds in India (Agric. Ledger, No. 9, 1901, p. 212).

May be propagated by seed—which takes about 3 months to germinate (Watt, l.c. & Kew Bull. l.c.) or good fresh seed will germinate in from 5–14 days (Brown, *seq.* p. 229)—or cuttings. In planting out in permanent places having regard to the size of the tree when mature, from 30–50 ft. of space must be allowed. Apart from any other consideration it is well worth growing for ornament and shade. The whole subject of the rubber production has been fully discussed in Kew Bull. 1888, pp. 217–220 "India Rubber in Upper Burma"; 1891, pp. 97–102, "Assam Rubber for West Africa"; 1896, pp. 171–174, "Cultivation of India Rubber in Assam"; 1897, pp. 429–430 & 1899, p. 87, "Assam Rubber in Egypt," reprinted in Add. series vii. "Rubber," pp. 155–170, and the following may also be referred to.

Ref.—"Ficus-Kautschuk," Warburg, in Der Tropenpflanzer," iii. 1899, pp. 419–438.——"Die Kultur von *Ficus elastica*" von

Landien, Medan, Sumatra, l.c. viii. 1904, pp. 673–676.——"*Ficus elastica* in Angola," Gossweiler, l.c. ix. 1905, pp. 581–584.——"Wie Vervielfältigt man den Karetbaum (*Ficus elastica*, Berkhout-Wageningen, l.c. x. 1906, pp. 505–516.——The Cultivation of *Ficus elastica*: The India Rubber of the East, Claud Bald, pp. 1–32 (W. Thacker & Co. London & Thacker, Spink & Co. Calcutta, 1906).——*Ficus elastica*: Its Natural Growth & Artificial Propagation: With a Description of the Method of Tapping the Tree and of the Preparation of Its Rubber for the Market, Coventry, Forest Bull. No. 4, 1906, pp. 1–35, illustrated (Supdt. Govt. Printing, Calcutta, 1906).——"Assam Rubber and Its Commercial Prospects, Mann, in Agric. Journ. India, i. 1906, pp. 390–398.——"The Tapping of Assam Rubber (*Ficus elastica*)," Mann, l.c. ii. 1907, pp. 277–279.——"*Ficus elastica*," in Comm. Prod. India, Watt, pp. 651–655 (John Murray, London, 1908).——"Ficus elastica-caoutchouc plant—Rangoon," in Bull. Agric. Congo Belge, i. 1910, pp. 254–256.—"Rambong Rubber (*Ficus elastica*)," in Report, Bot. St. Dominica, 1916–1911, pp. 7–8.——"Einiges uber-Gewinnung und Bereitung des Kautschuks von *Ficus elastica*, van Gelder, in Der Tropenpflanzer. xv. 1911, pp. 651–660.——"*Ficus*," in The Whole Art of Rubber Growing, Wicherley, pp. 85–91 (The West Strand Publishing Co. Ltd. London, 1911).——"Rubber of *Ficus elastica*" in Col. Rep. Misc. No. 82, 1912, pp. 336–342; Madras, Assam Gold Coast, Southern Nigeria (1909) & Seychelles.——"*Ficus elastica*" from Southern Nigeria," in Bull. Imp. Inst. x. 1912, pp. 208–209, with analysis.——"The Assam Rubber Tree (*Ficus elastica*)," in Rubber: Its Sources, Cultivation and Preparation, Brown, pp. 227–234.

Ficus elegans, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 128.

Ill.—Hooker, London, Journ. Bot. vii. 1848, t. 13 A. (leaf *Urostigma elegans*).

Vernac. name.—Abba (Lagos, *Millen*).

Lagos and also known from the Gold Coast, Togoland and the Cameroons.

Figs edible, Gold Coast (Johnson, No. 559, Herb. Kew).

A tree about 40 ft. high, Krobo Plains, Gold Coast (Johnson, l.c.); common in and around Lagos (Millen, Herb. Kew).

Ficus eriobotryoides, *Kunth & Bouché*; Fl. Trop. Afr. VI. Sect. 2, p. 160.

Asaba District, Nigeria and in Upper Guinea from Sierra Leone to the Cameroons, in the French Congo and East Africa.

Figs edible, Gold Coast (Johnson, Herb. Kew).

A tree 20–30 ft. high, sometimes much larger. Common in villages, Kumasi, juice sticky (Cummins, Herb. Kew). Has been cultivated in gardens (Chatsworth) as *F. Brassii* and (Kew) as *F. Neumanni*.

Var. **Caillei,** *A. Chev.* Fl. Trop. Afr. l.c. p. 161.

Ill.—Warburg & De Wildeman, Ficus Fl. Congo, t. 25 (*F. monbuttensis*).

Vernac. name.—Awaiyo (Hausa, *Lamb*).

Owerri District, S. Nigeria, Ankpa, N. Nigeria, and in the Belgian Congo.

Believed to yield balata in Bassa (Lamb, Herb. Kew).

A tree about 30 ft. high, Owerri, where it is very common (Sheriff, Herb. Kew).

Ficus exasperata, *Vahl.*; Fl. Trop. Afr. VI. Sect. 2, p. 110.

Ill.—Hooker, Lond. Journ. Bot. vii. (1848) t. 14c; Warburg, in Ann. Mus. Congo, vi. (1904) t. 7, f. 1c (*F. punctifera*); Warburg & De Wildeman, Ficus Fl. Congo, i. t. 7 (*F. punctifera*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 87 (*F. silicea*); t. 95, f. C (*F. scabra*).

Vernac. names.—Umfubu or Mufubu (Gazaland, *Swynnerton*); Mtabo, Mutaba, Barowre (Port. E. Africa, *Sim*); Msasa or Ursusa (Zanzibar, *Kirk*); Hasihraf (Arabia, *Barbey*); Mukemyu (Uganda, *Dawe*); Lixa (the leaves), Lima (the tree) (Golungo Alto, *Welwitsch*).

Lagos, Bonny, in S. Provinces, Nigeria, and in Upper Guinea from Senegambia to Fernando Po, and the Cameroons; also in Lower Guinea, Belgian Congo, Uganda, East Africa and Arabia.

Leaves used as sand-paper by the natives for wood-work and calabashes, Ebute Metta (Millen, Herb. Kew); used to polish calabashes, Abeokuta (Rowland, Herb. Kew), for polishing wood-work Rotamba Island, Sierra Leone and Zanzibar (Kirk Herb. & Mus. Kew), used as sand-paper by the natives of Samu Country, Sierra Leone (Scott Elliot, Herb. Kew), Gold Coast (Chipp, Herb. Kew), Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 1011), Chirinda Forest, Gazaland (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 205) and by the M'Chopes, Port. E. Africa to polish assegais, assegai-handles, spoons, walking-sticks, &c. (Sim, For. Fl. & For. Res. Port. E. Afr. p. 102).

A report on leaves from Zanzibar, made to Kew by Mr. Robson J. Scott (8, Whitefriars Street, London) in 1885, was that "they could not compete with glass paper at 24 sheets for 9*d.* which has a uniform and durable surface—glass paper abrades the surface of wood, the leaves only polish it; if you rub one upon the surface of a coin you will see how fine the cutting particles must be, they are silex I presume; even for metal I think that far better materials exist."

A tree, 60–70 ft. high, Victoria Nyanza (Dawe, Rep. Bot. Miss. Uganda, 1906 p. 57), 20 ft. high, Ebute Metta (Millen, l.c.), often a shrub 1–2 metres, occasionally 6–10 metres high Port. E. Africa (Sim, l.c.); frequently grown in avenues for purposes of shade, Golungo Alto (Hiern, l.c.).

May be propagated by stout cuttings.

Ficus glumosa, *Delile*; Fl. Trop. Afr. VI. Sect. 2, p. 171.

Vernac. names.—Kadeji (Katagum, *Dalziel*); Kawuru (Sokoto, *Dalziel*); Kela (Golo, Sudan, *Broun*).

Nupe, Katagum, Sokoto, Yola in N. Nigeria and in Upper Guinea from Senegal to the Cameroons; also in Eritrea, Abyssinia, Sudan, Angola and the Congo region.

Bark used for tanning, Bahr-el-Ghazal, Sudan (Broun, Herb. Kew), sweet fruit eaten (l.c.); figs turning red and succulent when ripe, Yola (Dalziel, Herb. Kew).

A large tree: 40–50 ft. fruit small, thickly covering the branches, Nupe (Barter, Herb. Kew); 25 ft. high, with milky juice, bark silvery grey and very soft, Bahr-el-Ghazal (Broun, l.c.).

var. **glaberrima,** *Martelli*; Fl. Trop. Afr. l.c.

Ill.—Hooker, Lond. Journ. Bot. vii. 1848, t. 12, f. B (*Urostigma rubicundum*).

Vernac. names.—Kawuri (Abinsi, *Dalziel*); Kili or Kele (Golo, Sudan, *Broun*).

Nupe, Lokoja, Abinsi in N. Nigeria and excepting Angola distribution as for the type.

Bark used for tanning, Sudan (Broun, Herb. Kew).

A tree, 30 ft. high, Nupe (Barter, Herb. Kew).

Ficus gnaphalocarpa, *A. Rich.*; Fl. Trop. Afr. VI. Sect. 2, p. 104.

Ill.—Miquel, Afr. Vijge-Boomen, t. 1, f. C (*Sycomorus trachyphylla*); t. 2, f. B (*S. gnaphalocarpa*).

Vernac. names.—Baure (Hausa, *Dalziel*); Opotto or Oapottoa (Yoruba, *Dudgeon*); Gemeise (Arabic, *Muriel*).

Katagum, Abinsi, Yoruba in Nigeria, and also known from Senegambia, Gold Coast, French Guinea, Cameroons, Abyssinia, Uganda, Angola, Damaraland, the Sudan, Egypt and East Africa.

Yields a latex which is discoloured pink by the sap of the tree with which it becomes mixed in tapping; boiled and allowed to cool the product is a reddish hardened substance, somewhat resembling gutta-percha in appearance, exported by the Niger Company (Dudgeon, No. 67, 1907, Herb. Kew; Agric. & For. Prod. W. Afr. p. 123). Figs edible (Dalziel, Hausa, Bot. Voc. p. 14).

Trees laden twice a year with an abundance of peach-coloured figs, tolerably juicy, somewhat sweet and used by several colonists for the extraction of a very excellent spirit, tasting like a superior gin and suggested by Welwitsch as a profitable industry (Hiern, Cat. Welw. Afr. Pl. i. p. 996—*F. trachyphylla*).

A large tree, one of the commonest in the country, Abinsi in Nigeria (Dalziel, Herb. Kew); a spreading tree, 50–60 ft. high open plains in *Acacia* forest, S. Angola (Pearson, Herb. Kew).

a large tree observed generally throughout the Sudan and in Egypt (Muriel, Herb. Kew). Propagated by cuttings and might be grown for ornament and shade.

Ficus ingens, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 121.

Ill.—Ferret & Galinier, Voy. Abyss. Atlas, t. 2 (*F. Schimperiana*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 93, f. B (*F. magenjensis*).

Vernac. names.—Beuji (Hausa, *Lamb*); Asofeyeje (Lagos, *Foster*); Mtoza (Magenji da Costa, Port. E. Africa, *Sim*).

Lagos, Zaria in Nigeria, Senegal, Cameroons, Togoland, Gold Coast, Shari region, Nile region and Mozambique to Tropical Transvaal and also in S. Africa.

A tree or shrub.

Ficus iteophylla, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 203.

Vernac. name.—Shirinia (Katagum, *Dalziel*).

Katagum, Sokoto, in Nigeria and in Senegal and the Sudan.

Food for goats, Katagum (Dalziel, Herb. Kew).

A tree (Dalziel), epiphytic (Broun).

Ficus katagumica, *Hutchinson*; Fl. Trop. Afr. VI. Sect. 2, p. 122.

Ill.—Kew Bull. 1915, p. 317.

Vernac. name.—Kawerri (Katagum, *Dalziel*).

Katagum, N. Nigeria.

A shady tree.

Ficus kawuri, *Hutchinson*; Fl. Trop. Afr. VI. Sect. 2, p. 122.

Vernac. name.—Kawuri (Hausa, *Dalziel*).

Lokoja.

Yields a white latex collected as rubber (Dalziel, Hausa, Bot. Voc. p. 60).

A large tree.

Ficus Leprieuri, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 158.

Ill.—Notizbl. Bot. Gart. Berlin, v. 1908 (*F. triangularis*); Engler & Drude, Veg. Erde, ix (1910) p. 682, f. 580 (*F. triangularis*).

Vernac. name.—Abadan (Lagos, *Macgregor, Dawodu, Dodd*).

Lagos and in Upper Guinea from Senegambia to the Cameroons.

A good rubber, Liberia (Whyte No. 10, Herb. Kew); rubber useless, Liberia (Sim, No. 36, Herb. Kew); used for guinea worms, Lagos (Dawodu, No. 251, Herb. Kew).

Tree about 70 ft. high (Sim, l.c.); a creeper (Whyte, l.c.).

Ficus lyrata, *Warb.*; Fl. Trop. Afr. VI. Sect. 2, p. 142.

Ill.—Gard. Chron. Sept. 30th, 1911, p. 234, ff. 107, 108 (*F. lyrata* (*pandurata*)).

Cameroons, Liberia, Ivory Coast, Dahomey, Togoland and French Gaboon.

A tree up to 40 ft., grown for avenues, Bismarckburg, Togoland (Büttner). Grown in gardens in the United States, Berlin, Brussels and the Royal Gardens, Kew, as a decorative plant; propagated by cuttings. In the Gardeners' Chronicle (l.c.) it is stated that "among large-leaved (20 in. × 8 in.) Ficuses this is certainly one of the best yet introduced."

Ficus Mucoso, *Welw.*; Fl. Trop. Afr. VI. Sect. 2, p. 98.

Vernac. names.—Mukunyu or Mukonyu (Uganda, *Dawe*).

Cameroons—Bipinde and cultivated in the Botanic Garden at Victoria; also known from Ivory Coast, Gold Coast, Uganda, Gaboon, Angola, Belgian Congo, East Africa.

Canoe-like troughs used in making banana beer are made from this tree, Uganda (Dawe, Herb. Kew).

A small tree 10–12 ft. high (Fl. Trop. Afr. l.c.), a tree 80 ft. figs on branches each 2 in. in diameter, Ashanti (Cummins, No. 5, Herb. Kew).

Ficus natalensis, *Hochst.*; Fl. Trop. Afr. VI. Sect. 2, p. 208.

Ill.—Sim, For. Fl. & For. Res. Port. E. Afr. t. 90, f. A (*F. natalensis*, var. *pedunculata*).

Vernac. names.—Sango (Uganda, *Dawe*); Uluzi, Umtombe (Port. E. Africa, *Sim*).

Cameroons, Gold Coast, Fernando Po; also in Lower Guinea, Uganda, Mozambique District, Natal, &c.

A source of the bark cloth of Uganda; said to yield the best cloths, sold amongst the natives at 2 rupees each (Dawe, No. 319, Herb. Kew)—Dawe (on specimen No. 286 in the Herbarium) states that in Buddu, the "Kitubalu" (*F. Kitubalu*, Hutchinson) yields an inferior bark-cloth, planted only when other varieties are unobtainable; bark supplies a rough native cordage, Portuguese East Africa (Sim, l.c. p. 98) who describes the fruit as "hardly edible."

Tree about 40 ft. high, Gold Coast (Johnson, Herb. Kew) or a shrub 20–25 ft. high, on the beach, Fernando Po (Mann, Herb. Kew). Sometimes an epiphyte beginning "in the fork "of a branch and sending down roots from any height which "eventually enclose and kill the original tree, leaving the *Ficus* "standing alone, the roots then forming a buttressed trunk a "metre or more in diameter; on old trees adventitious roots are "produced abundantly from old wood well up the stem or "branches and hang in masses 1–2 metres long: it strikes easily "and is used as a street tree," Port. E. Africa (Sim, l.c.). There is in the Museum at Kew, a specimen of Oil Palm trunk, from Aburi, Gold Coast (Johnson, 1898) completely encircled by this *Ficus*.

Ficus ovata, *Vahl ;* Fl. Trop. Afr. VI. Sect. 2, p. 164.

Ill.—Johnston, Liberia, ii. p. 652, t. 265 (*F. Johnstonii*).

Vernac. names.—Gamji (Hausa, *Lamb*); Ditondo (Angola &c. *Buchner*); Nserere (Cent. Africa, *Mildbraed*).

Bassa Province, N. Nigeria, and in Upper Guinea from Senegambia to the Cameroons, Lower Guinea, Nile Land, Belgian Congo and Mozambique District.

Yields an inferior bark-cloth (Mildbraed, Fl. Trop. Afr. l.c.) " supposed to yield rubber " (Johnston, l.c.) and described as " a rubber tree about 8 ft., on the Sugar Loaf," Sierra Leone (Scott Elliot, Herb. Kew).

A large tree with a very broad crown (Fl. Trop. Afr. l.c.) and therefore suggested as a shade tree.

Ficus platyphylla, *Delile*; Fl. Trop. Afr. VI. Sect. 2, p. 197.

Ill.—Miquel, Afr. Vigge-Boomen, t. 4, f. B (*Urostigma Kotschyanum*).

Vernac. names.—Ganji or Gamji (Katagum, Kano, *Dalziel*); Ogbagba (Yoruba, *Dudgeon*); Danko Gawi (Kano, *Dudgeon*); Imkoo (Madi, *Grant*); Kili (Sudan, Bull. Imp. Inst. 1911, p. 206); Kwell, Fungo, Kubo (Bahr-el-Ghazal, Sudan, Col. Rep. Misc. No. 82, 1912, p. 354).—Flake or Red Kano Rubber, Niger Gutta.

Yoruba, Katagum, Bornu, in Nigeria and also known from Senegambia, Gambia, Gold Coast, Togoland, Cameroons, Nubia, Sudan, and Uganda.

The source of " Kano Rubber " or " Ballata " [so-called] of the Trade, Yoruba (Dudgeon, No. 65, 1907, Herb. Kew); strong milky juice which coagulated, yields a product similar to caoutchouc, Bornu (Vogel, No. 73, Herb. Kew). A sample of " Niger Gutta," from a consignment bought in Lagos at 4½*d.* per lb.—from Katsena, N. Nigeria, examined in England was found to be reddish-brown, hard and to contain 80 per cent. of resin and 12 per cent. inferior caoutchouc, used by certain rubber manufacturers in special mixtures; but this gutta is not usually sold in the open market and the demand is limited (Col. Rep. Misc. No. 82, 1912, p. 352). A sample from the Gambia, submitted by the Colonial Office to Kew in July 1902 was reported on by a London Firm, who stated our Liverpool House reports that this is known as " Red Gambia," which from 1897 to 1899 arrived in moderate quantities and was at first readily bought by manufacturers at about 1*s.* 10*d.* per lb.; later, however, it was found unsatisfactory and the price went down to as low as 8*d.* and finally supplies entirely ceased. Importers say it will not pay to import unless it will fetch 1*s.* 2*d.*–1*s.* 3*d.* which judging from past experience is more than its value (Mus. Kew). " Ogbagba " rubber in Nupe is prepared by boiling to the consistency of a hardened paste, similar to the gutta made from the latex of the " Shea Butter " tree (*Butyrospermum Parkii—see* p. 410) (Dudgeon, Agric. & For.

Prod. W. Afr. p. 122). Latex when dried is used for sealing native pots, Gold Coast (Johnson, No. 522, Herb. Kew); milk used by bird-catchers, Madi (Grant, Trans. Linn. Soc. xxix. p. 149).

The bark is one of the tanning materials of the Sudan (Bull. Imp. Inst. l.c.); under the name *F. platyphylla*, Scott Elliot states (Col. Rep. Misc. No. 3, 1893, p. 40) that "the bark of several kinds of 'Gongo' or 'Gongwe' is chewed with kola nut" in Sierra Leone, and the bark is much used in making bark-sheets and ropes, Madi (Grant, l.c.). The Monbuttu weave the bast of the bark into a very durable fabric, used for clothing, for which purpose they cultivate it near their huts (Schweinfurth, Heart of Africa, ii. pp. 88, 102).

A large tree, 80 ft. high, 24 ft. in circumference at 3 ft. from the ground, often epiphytic on other trees, Bornu (Vogel, l.c.); about 80 ft. high, Shai Plains, Gold Coast (Johnson, l.c.) and in the Nile region—5° S. to 3° 15″ N. Grant (l.c.) observed several noble specimens—one measured 12 ft. in circumference, 5 ft. from the ground, another was 20 ft.; planks 10 ft. long might have been cut from them."

The fruits on this tree are axillary at the ends of the branches; but it would be possible to propagate it freely from cuttings.

Ref.—"Kano Rubber," in India Rubber Journ. Dec. 28th, 1906, p. 680.——"Product from *Ficus platyphylla*," Col. Rep. Misc. No. 82, 1912, pp. 351–354.

Ficus polita, *Vahl*; Fl. Trop. Afr. VI. Sect. 2, p. 124.

Ill.—Warburg & De Wildeman, Ficus Fl. Congo, t. 20 (*F. niamniamensis*); Sim, For. Fl. & For. Res. Port. E. Afr. t. 88 (*F. umbrosa*, excl. of figs).

Vernac. names.—Durumi (Katagum, Zungeru, *Dalziel*); Totowe (Port. E. Africa, *Sim*).

Katagum, Zungeru, Owerri in Nigeria, and in other parts of Upper Guinea from Senegal to the Cameroons, also in Shari region, Nile region, Angola, Belgian Congo and East Africa.

A common shade tree planted in towns, Katagum, Zungeru, &c. (Dalziel, Nos. 321, 568, Herb. Kew); grows about 50 ft. high; receptacles on old wood (Fl. Trop. Afr. l.c.); 20–25 ft. high, head very broad, Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 996); sometimes epiphytical, becoming later independent (l.c. p. 998).

Ficus populifolia, *Vahl.*; Fl. Trop. Afr. VI. Sect. 2, p. 189.

Ill.—Vahl, Symb. Bot. Pl. i. t. 22; Schweinf. Pl. Nil. t. 16 (habit); L'Agric. Col. Italy, iv. 1910, p. 374, f. 45 (leaf); Engl. & Drude, Veg. Erde, ix. p. 86, f. 67.

Vernac. names.—Bijaje (Hausa, *Dalziel*); Wa (Katagum, *Dalziel*).

Kilba, N. Nigeria, Cameroons, Eritrea, Somaliland, E. Africa, Sudan and Arabia.

Figs said to be edible and bark said to be an ingredient in arrow-poison, N. Nigeria (Dalziel, Herb. Kew, and Hausa Bot. Voc. p. 15); figs edible, Somaliland (Hildebrandt, Herb. Kew).

A large tree, grows only near water, found at 3000–5000 ft. alt., Somaliland (Thompson, Herb. Kew), tree with drooping branches, growing on granite hills, Kilba country (Dalziel Herb. Kew) or rocky hills, Yola Province, N. Nigeria (Dalziel, Hausa Bot. Voc. p. 15), on rocks, Nyellim, Central Shari (Chevalier, Herb. Kew) and on granite, Jebelem Hill, White Nile, Sudan (Broun, Herb. Kew).

Ficus Thonningii, *Blume;* Fl. Trop. Afr. VI. Sect. 2, p. 187.

Ill.—Hooker, London Journ. Bot. vi. 1847, t. 22, f. A (*Urostigma Schimperi*); vii. 1848, t. 13, f. C (*U. Thonningii*); Notizbl. Bot. Gart. Berlin, v. 1908, t. 2 (*F. Rocco*); Engl. Pflan. Ost. Afr. C. t. 8, ff. A–F (*F. chlamydodora*); Engl. & Drude, Veg. Erde, ix. p. 664, t. 36 (habit).

Vernac. names.—Chediya (Hausa, *Dalziel*); Chida or Chedia (Sokoto, Katagum, *Dalziel*); Rokko (Monbuttu-land, *Schweinfurth*).

Lagos, Katagum, Sokoto in Nigeria and widely distributed in Tropical Africa from Sierra Leone in the West to Nyasaland and Mozambique in the East.

Bark used for making cloths (Mildbraed, Afrik. Ficus in Engl. Bot. Jahrb. xlvi. 1911–12, p. 173), figs edible—*see* note (under *F. gnaphalocarpa*) as to uses in Angola.

A medium-sized tree up to about 40 ft. high; largely grown in Lagos for street shade (Dawodu, Herb. Kew); a shady tree planted in towns, N. Nigeria (Dalziel, Herb. Kew) and Welwitsch considers that this tree together with *F. gnaphalocarpa* (*q.v.*) belong to the most stately trees of Tropical Africa both on account of their large-leaved and widely-extended heads with brick-red branches, as well as for the abundance of their peach-coloured figs—somewhat sweet and tolerably juicy—with which they are laden twice a year (Hiern, Cat. Welw. Afr. Pl. i. p. 996—*F. psilosoga*).

Ficus umbellata, *Vahl;* Fl. Trop. Afr. VI. Sect. 2, p. 124.

Ill.—Warburg & De Wildeman, Ficus Fl. Congo, t. 2 (*F. megalodisca*).

Vernac. names.—Yendi (Hausa, *Lamb*); Nyedua (Gold Coast, *Armitage*); Gongwe (Sierra Leone, *Scott Elliot*).

Bida in N. Nigeria and has also been collected in French Guinea, Sierra Leone, Gold Coast, Togoland, Cameroons, French Congo, Belgian Congo and Angola.

There are numerous edible figs amongst the wild forms of *Ficus*, usually called "Gongo" or "Gongwe" in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 40).

This species—apparently of little importance—is mentioned here for the above reason and also because the same native

name "Nyedua" on the Gold Coast is applied to *Ficus Vogelii*; the native name Armitage explains (Report on Rubber Trees and Vines; Encl. in Letter Col. Office to Director Kew, Nov. 30th, 1898) means "to grow round" and hence suggestive of its epiphytical nature; it differs from the more valuable "Nyedua" in having ovate-orbicular or nearly orbicular leaves.

A tree 20–25 ft. high densely frondose all over and even from a little above the base; trunk nearly a foot in diam. Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 999).

Ficus Vallis-Choudae, *Delile*; Fl. Trop. Afr. VI. Sect. 2, p. 103.

Ill.—Ferret & Galinier, Voy. Abyss. Atlas Bot. t. 1; Miquel, Afr. Vigge-Boomen, t. 2A (*Sycomorus Schimperiana*); Warburg & De Wildeman, Ficus Fl. Congo, t. 23.

Vernac. names.—Baurin Kiashi (Katagum, *Dalziel*); Ndahi (Sierra Leone, *Scott Elliot*).

Nupe, Katagum in N. Nigeria and widely spread in Tropical Africa, on the West Coast from Sierra Leone to the Cameroons and extending through the Nile Land—Abyssinia, Uganda, &c. to the Belgian Congo and East Africa.

Bark eaten with kola, Sierra Leone (Scott Elliot, Herb. Kew; Col. Rep. Misc. No. 3, 1893, p. 40—*F. trachyphylla*). Figs large, edible, Nupe (Barter, Herb. Kew).

A tree, 40 ft. high, Nupe (Barter, l.c.); a small tree by bush streams, Katagum (Dalziel, Herb. Kew).

Ficus verruculosa, *Warb.*; Fl. Trop. Afr. VI. Sect. 2, p. 114.

Kontagora, Nupe in Nigeria, and also known from the Cameroons, Angola, Shari region, Uganda, Gazaland, Nyasaland, Portuguese E. Africa, and Rhodesia.

Figs turning red, eaten by the negroes, Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 1004).

Described variously as a tree of moderate size 15–25 ft. high or more, or when occurring in swampy ground often a small shrub with straight unbranched stem (Fl. Trop. Afr. l.c.); an unbranched plant, 3 ft. covering deep morasses with its thickly matted roots and creeping stems, Nupe (Barter, No. 1317, Herb. Kew); a caespitose undershrub with creeping root-stock, about 2 ft. high, stem reddish purple and scarlet, not uncommon, but found only in wet and humid situations together with grasses, Angola (Gossweiler, No. 1006, Herb. Kew) and a large tree not uncommonly above 80 ft. high and 3–10 ft. in diam. branches spreading, aerial slender, blood-red, Angola (Hiern, l.c.).

Ficus Vogeliana, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 94.

Lagos (a var. *latifolia*, Hutchinson), Oban in S. Nigeria, and also Ivory Coast, Cameroons, Fernando Po and Spanish Guinea.

Wood used by the natives to make soap, Ambas Bay (Mann, Herb. Kew).

A tree, 40–50 ft. high (Mann, l.c.).

Ficus Vogelii, *Miq.*; Fl. Trop. Afr. VI. Sect. 2, p. 179.

Ill.—Christy, New Comm. Pl. & Drugs, No. 2, 1898, p. 10 (*Urostigma Vogelii*); Schlechter, Westafr. Kautsch. Exp. p. 11; Yves Henry, Caoutchouc Afr. Occid. Franc. t. 1 (habit); Notizbl. Bot. Gart. Berlin, v. 1908, t. 1; App. xxii. 1909, p. 75, f. 34; Johnston, Liberia, ii. t. 264: Engl. & Drude, Veg. Erde, ix. p. 683, f. 581; Dudgeon, Agric. & Forest Prod. W. Africa, p. 3 (habit).

Vernac. names.—Abba (Lagos, *Moloney*, *Millson*); Awaiyo (Hausa, *Lamb*, *Foster*); Obada (Yoruba, *Foster*); Ogbogbo (Bassa, *Elliott*); Akbaha, Tora (Sierra Leone, *Scott Elliot*); Gongwi—the tree, Sawar—the rubber (Sierra Leone, *Lane Poole*); Dob (F. W. Africa, *Yves Henry*, *Chevalier*); Memeluku (Gold Coast, *Tudhope*); Nyedua (Gold Coast, *Armitage*); Manjedua (Gold Coast, *Chipp*); Taba-nika-samu (Hausa, *Dalziel*); Kobbo (Mandingo, *Dudgeon*); Kobooulé (French Guinea, *Pobeguin*). ——Memeluku Rubber.

Lagos, Old Calabar, Cross River, Engenni River, Nun River, in S. Nigeria; Bassa in N. Nigeria and also commonly found in Upper Guinea from Senegal to the Cameroons, extending to the Belgian Congo.

This Ficus has for a long period been known as the source of an inferior grade of rubber from Lagos and West Africa in general, sometimes called "balata" in the trade; the poor quality is due to a large proportion of resin. Bought on the Niger (1911) at about 1*s*. 3*d*. per lb. (Foster, Nig. Trees & Pl. p. 63). A sample of block "balata" from the Bauchi Province, N. Nigeria was found to contain equal proportions of caoutchouc and resin and was valued (1911) at 1*s*. 8*d*. per lb. in Liverpool, when it was reported there is a good market in the United Kingdom for block "balata" of this kind and consignments can be sold at almost any time. The sample in question was found to correspond in composition with the product of *Ficus Vogelii* from the Gambia and the Gold Coast (Col. Rep. Ann. No. 738, 1912 (for 1911) "N. Nigeria," p. 31; Misc. No. 82, 1912, p. 347), where (Gold Coast) it should be mentioned the establishment of a market in "Memeluku Rubber" was in 1908 considered doubtful (Ann. Rep. Dept. Agric. Gold Coast, 1908, p. 10; Col. Rep. Misc. l.c. p. 347).

On a specimen in the Herbarium at Kew (Lane Poole) from Sierra Leone the rubber is stated to be "of little value and is used as an adulterant of *Landolphia* and *Funtumia* rubber."

The latex is coagulated by heating (l.c.) and "on account of its many branches it is a difficult tree to tap; the Natives (Gold Coast) usually cut the tree down and then channel the trunk and branches, repeating the process after an interval of eight days; an average Nyedua tree will yield four or more double gin flasks of juice; a large tree yields eight double gin flasks of rubber on the first tapping and four on the second" (Armitage, Report Rubber Trees and Vines, Encl. in Letter, Col. Office to

Director, Kew, Nov. 30, 1898). Three quarts of milk were extracted from a tree (described below) at Badagry, Lagos, without injuring it in any way, during the dry season and when in fruit and it was suggested that from four to five gallons could have been obtained with but little trouble between the months of July and February (Kew Bull. 1888, p. 254; Add. Ser. vii. p. 143) where full particulars of tapping and coagulating are given.

A tree 40 ft. high, banks of the Nun (Mann, Herb. Kew); about 40 ft., Gold Coast (Johnson, Herb. Kew), large and umbrageous, and throws out many branches at a height of from 3–5 ft. from the ground, seldom seen in the forests; but met with in every village in Sefwhi and Wam, Gold Coast, where it serves as an excellent shade tree and the name "Nyedua-Djidua —to grow round" is given because of the epiphytical character; a branch of Nyedua taken from a tree and planted is said to become a fair-sized tree in 3 years (Armitage, l.c.) and a tree at Badagry, Lagos, 13 years old was from 50–60 ft. high, 6 ft. 4 in. in girth at 3 ft. from the ground and foliage area a quarter of an acre; large spreading trees, planted for shade in the market places, streets and compounds, are commonly seen. It is planted by the simple method of cutting off a branch and pushing it in the ground and is largely used for fence posts (Millson, Kew Bull. l.c.), and it is reported that the "native balata" is being grown from seed and promises well in N. Nigeria (Lamb Ann. Rep. Dept. Agric. 1914, p. 3).

Ref.—"Lagos Rubber (*Ficus Vogelii*)," in Kew Bull. 1888, pp. 253–261; 1890, pp. 89–93: Add. Series vii. "Rubber," pp. 141–155.——"Rubber of *Ficus Vogelii*," in Col. Rep. Misc. No. 82, 1912, pp. 342–347.——Balata Rubber (*Ficus Vogelii*) in Bull. Imp. Inst. x. 1912, pp. 209–210.

Castilloa, Cervant.

Castilloa elastica, *Cerv.* in Suppl. Gaz. Lit. Mexico (1794), p. 7.

A tree 60 ft. high and upwards. Leaves 10–16 in. long, 4–6 in. broad, oblong-lanceolate, base cordate, apex acuminate, rough, somewhat hairy, dark green above, softer and paler below. Inflorescence, unisexual, green, flat or concave receptacles.

Fruiting receptacles 10 in. or so in diam. containing 35–45 achenes; fleshy & brick red when ripe: seeds more or less ovoid; about $\frac{1}{3}$–$\frac{1}{2}$ in. by $\frac{1}{4}$ in. through: testa white and papery.

Castilla elastica, Cervantes, in Pittier, Genus *Castilla*, Contr. U.S. Nat. Herb. xiii. part 7, 1910, p. 277.

Ill.—Collins, Caoutchouc, t. 2; Trans. Linn. Soc. ii. (1881–1887) tt. 27–28; Köhler, Med. Pflan. iii; Ann. Jard. Bot. Buitenzorg, xiv. 1896, t. 1 (habit); Jumelle, Pl. Caoutchouc et a Gutta, p. 37, f. 3; Tropenpfl. ii. 1898, p. 339,; Rev. Cult. Col. viii. 1901, p. 331; Preuss, Expedit. Cent. und Südamer.

pp. 370–375; Cook, U.S. Dept. Agric. Pl. Indust. Bull. No. 49, 1903, tt. 1–18; Tropenpfl. ix. 1905, p. 447 (tree Tabalong, Borneo, 2½ years old); Engl. Bot. Jahrb. xxxv. 1904–05, p. 674 f. G; L'Agric. prat. pays chauds viii. 1, 1908, p. 105; Pittier, Contr. U.S. Nat. Herb. xiii. part 7, (1910, t. 43 (*Castilla*); Dudgeon, Agric. & Forest Prod. W. Africa p. 9, f. 6; Bull. Agric. Congo Belge, iii. 1912, p. 903, f. 583 (tree 4½ years at Sao Thome).

Central American Rubber Tree, Mexican Rubber Tree.

Native of Mexico. Cultivated in the various Tropical Colonies—Ceylon, Singapore, Mauritius, Jamaica, Trinidad and other Islands in the West Indies, West Africa, including Nigeria; in East Africa, Uganda, &c. distributed from Kew.

Some uncertainty as to the value of this tree for cultivation for rubber production seems to have arisen of late. It has been recommended as a shade or shelter tree, because of being a deep rooter, for Cocoa, Coffee, etc. For this purpose it is not now recommended in Trinidad (Freeman, Bull. Dept. Agric. Trinidad & Tobago, xvii. 1918, p. 115), in St. Lucia (Hudson, Rep. Bot. St. St. Lucia 1906–07, pp. 27–28: Trop. Life, Sept. 1908, p. 135), nor in Dominica (Jones, West Indian Bull. xiii. 1913, pp. 253–258), and trials show that the yield is not satisfactory.

The Rubber Committee of the Board of Agriculture, Trinidad, have come to the following conclusions:—"That the planting of Castilloa as a pure crop is not profitable anywhere"; that "the further planting of Castilloa even as a shade for Cacao is inadvisable, except on or near estates where it is already proved that Castilloa can be grown without injury to the Cacao crop while returning some revenue itself" and that "where Castilloa has already been established and makes vigorous growth, it will pay to tap it" (Freeman, l.c. p. 116). Opinions have been advanced giving no encouragement whatever for the cultivation of this tree; but without going so far as this it would seem advisable not to rely on it, more especially in situations where it may be just as convenient to grow Para rubber. *Castilloa*, however, has a decided advantage over *Hevea* in not being so readily uprooted by storms, and might therefore form a useful shelter tree, making at the same time some return in rubber.

The tree has been planted at Old Calabar, Ebute Metta, Oloke-Meji, Lokoja, etc., but nowhere in the Colony does it appear to have reached any importance. In 1898 at Old Calabar two plants only were living; in 1900, 18 were put out in permanent places. In 1907 there were 1000 seedlings in the Nursery at Lokoja (Shaw, N. Nig. Gaz. May 31st, 1907, p. 38). In 1905 it was reported that the cultivation at Oloke-Meji had proved a failure, the plants having been exterminated by a boring beetle (*Inesida leprosa*) and that the same insect attacked the parent trees at Ebute Metta (Col. Rep. Ann. No. 507, 1906, p. 25), practically exterminating them, not so seriously in Old Calabar

where one or two good healthy trees exist and trees apparently suffering in the same way wherever planted in Southern Nigeria (Thompson, Col. Rep. Misc. No. 66, 1910, p. 12). A one acre plot at Tarkwa, Gold Coast, was unsuccessful owing to the trees being damaged and killed by boring longicorn beetles which attack both the roots and the stem (Rep. Agric. Dept. Gold Coast, 1908, p. 24) and on a fairly large plot at Aburi, Gold Coast, every tree was found to be seriously attacked by a borer (Thompson, Col. Rep. l.c.).

Trees may be raised from seed, which soon loses its vitality. The writer in 1900 received 1000 seeds packed in charcoal from Trinidad of which only 1 per cent. germinated. Raised in nursery beds, in bamboo pots or sown at stake the plants for a permanency should be given a distance apart of at least 18–20 ft. Good drainage, a tropical climate with a good rainfall, 70–80 ins. at least, are essential conditions and a loamy soil is recommended. This tree is one that suffers if the trunk is exposed to sunlight and some undergrowth or catch-crop such as bananas should be used for shade until the trees are large enough to shade themselves.

The native method of tapping is effected by cutting down the trees and ringing the bark at convenient distances along the trunk (Kew Bull. 1899, p. 69), after the same manner as for "Gutta Percha" in Malaya (p. 405), "Balata," in Guiana (p. 416) or "Lagos Silk Rubber" in West Africa (p. 456); using a "machete-" like knife (specimen in the Museum, Kew, has a blade 12 in. long and 2 in. broad, with a sharp edge of 3 in. only near the handle) and any improvement in the methods have been effected somewhat on the same lines as for these trees. On Mexican Plantations large V incisions are common. No method, however, appears so far to have been evolved approaching the perfection of that for *Hevea*. In Trinidad it is considered that the most profitable method is by tapping with the cutlass, two or three times a year, in dry weather and collecting the rubber four days later in the form of "scrap ball"; the cuts are recommended to be made about one foot apart on one side of the tree only, and made obliquely upwards in order to prevent rotting, due to the entry of rain (Freeman, l.c. p. 117). Before beginning to tap, the trunk should be at least 12 in. in diameter; about 40–45 ft. high or 9–10 years old (Kew Bull. 1899, p. 160).

The latex coagulates readily and is sometimes so thick that it can only be collected in the form of scrap, from the tree after the manner of *Ficus elastica*. When a coagulant is necessary a native method is by a decoction of the "Moon-plant" (*Calonyction speciosum*, Choisy—*see* p. 474 for some particulars of this plant)—the stems are pounded into a mass and thrown into a bucket of water, the decoction is strained and added to the rubber-milk in the proportion of one pint to a gallon or until after brisk stirring the whole of the milk is coagulated; the floating rubber is strained, kneaded into cakes and pressed to get rid of all water, dried and packed for export (Kew Bull.

Dec. 1887, p. 16). Another native method is that of spreading the latex on leaves of a species of *Calathea*; putting two prepared rubber faces together and pressing and afterwards removing the leaves. The latex may also be diluted with hot water, and allowed to stand until the rubber collects like cream, when it may be removed and treated like that of *Hevea* to form " sheets " or " crepe." The use of a centrifugal machine, ordinary evaporation and coagulants of an alkaline character, as alum may also be resorted to.

The yield of trees cultivated under good conditions is estimated at 1 lb. of rubber per annum for trees 9–10 years old (Kew Bull. 1899, p. 161); but some variation may be looked for more or less according to age and certain climatic conditions, and taken generally the yields from this tree appear to have been somewhat disappointing.

Ref.—On the *Castilloa elastica* of Cervantes and some Allied Rubber Yielding Plants, in Trans. Linn. Soc. ii. 1886, pp. 209–215.——" Castilloa Rubber of Central America (*Castilloa elastica*)" in Kew Bull. Dec. 1887, pp. 13–16; 1899, pp. 159–164.—— " Peruvian Rubber," l.c. 1899, pp. 68–72; reprinted in Add. Series, vii. " Rubber," pp. 170–184.——" The Mexican Rubber," Dering, in Dip. & Cons. Rep. Misc. No. 385, 1895, pp. 23–27.—— " Panama Rubber (*Castilloa*)," Royal Bot. Gardens, Ceylon, Circ. No. 11, 1899, pp. 95–104.——" *Castilloa*," in Expedition, Central & Sud-Amerika, Preuss, pp. 369–384 (Berlin, 1901).——" Le *Castilloa* " in Les Plantes a Caoutchouc et leur Culture, Warburg (Aug. Challamel, Paris 1902).——" *Castilloa*," in Les Plantes a Caoutchouc et a Gutta, Jumelle, pp. 185–225 (Aug. Challamel, Paris, 1903).——The Culture of the Central American Rubber Tree, Cook, U.S. Dept. Agric., Bureau Pl. Industry, Bull. No. 49, 1903, pp. 1–86, plates i.–xviii; reprint in The India Rubber Journ. Nov. Dec. 1903 and Jan. 1904; Review in Bull. Imp. Inst. ii. 1904, pp. 32–39.——" Central American Rubber," Jones, in West Indian Bull. vii. No. 1, 1906, pp. 16–20.——*Ibid.*, Moore, l.c. pp. 21–29.——" Castilloa Rubber in Dominica," Jones, l.c. xiii. No. 3, 1913, pp. 253–258.——" Castilloa or Central American Rubber," Fawcett, in Tropical Life, Sept. 1908, pp. 137–138. ——" A Preliminary Treatment of the Genus *Castilla* " Pittier in Contr. U.S. Nat. Herb. xiii. part 7, 1910, pp. 247–279.—— " The Castilloa Industry in Mexico and Central America," Smith, in Bull. Dept. Agric. Trinidad, x. Jan.–March 1911, pp. 81–93. ——" *Castilloa elastica*," in The Whole Art of Rubber Growing Wicherley, pp. 92–99 (West Strand Publishing Co. Ltd. 1911).—— " Castilloa in Cuban Valleys," in The India Rubber World, xlvi April 1st, 1912, pp. 315–322.——" Castilloa Rubber," in Col. Rep. Misc. No. 82, 1912, pp. 299–312; India-Nilgiris, Trinidad & Tobago, Dominica, St. Lucia, Venezuela and Zanzibar.—— " *Castilloa elastica* Seeds," in Col. Rep. Misc. No. 88, 1914, pp. 499–500, from Trinidad, with analysis.——" The Central America Rubber Tree: *Castilloa elastica*," in Rubber: Its

Sources, Cultivation and Preparation, Brown, pp. 212–226 (John Murray, London, 1914).——" *Castilloa elastica*," in Rubber Cultivation in Trinidad and Tobago: Report of the Special Committee of the Board of Agriculture, pp. 116–123; reprint from Bull. Dept. Agric. Trinidad and Tobago, xvi. 1917.

Antiaris, Lesch.

Antiaris africana, *Engl.*; Fl. Trop. Afr. VI. Sect. 2, p. 223.

Ill.—Engl. & Drude, Veg. Erde, ix. p. 780, f. 660 B.

Vernac. names.—Roko bokun (Nupe, *Yates*); Oro (Lagos, *Moloney*, *Thompson*, *Foster*, *Punch*, *Dodd*); Chenchen (Ashanti, *Chipp*); Chen-Chen, Ofu, Ohonton (Gold Coast, *Thompson*); Ako, Akédé, Bofi, Mbopon (Ivory Coast, *Courtet*).

Lagos, Ibadan, Nupe, Yola in Nigeria; also known from Sierra Leone, Gold Coast, Togoland, Dahomey, and Fernando Po.

Timber very light and soft, used for making canoes, Gold Coast (Johnson, Herb. Kew); white and soft, density 0·362–0·408, used for joinery work, Ivory Coast (Courtet, L'Agric. prat. pays chauds, x. 1, 1910, p. 463); timber useless, Ibadan Forest Reserve (Punch, Herb. Kew); light coloured, soft and of little value; weight about 21 lb. per cubic ft. (Foster, Nig. Trees & Pl. p. 63). The bast fibres are beaten out to form a native cloth, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 198). Latex used as a rubber adulterant, Ashanti (Chipp, Herb. Kew): mixed with that of "Ire" [*Funtumia elastica*, p. 453]; but will not coagulate by itself and spoils good rubber, Ibadan (Punch, l.c.).

Tree, 20 ft. high, Nupe (Barter, Herb. Kew), about 50 ft. high, with smooth white bark, fruit red, Oloke Meji (Dodd, Herb. Kew); large, spreading, elm-like, generally destitute of leaves in December, fruit turning from green to reddish, Nupe (Yates, Herb. Kew); flowers in January at which time the tree is leafless (Foster, l.c.); trees have been observed on the Gold Coast described as enormous, pyramidal (Johnson) and large (Thompson, Chipp) and 35–40 metres high, trunk 0·90 m.–1 m. 30 in diameter, with buttresses upwards of 2 metres, Ivory Coast (Courtet, l.c.).

In reference to the use of the bark for making native cloth and the wood for canoes on the Gold Coast, Dawe (Rep. Bot. Miss. Uganda, 1906, pp. 5, 32, 57), describes a striking tree (believed to be *A. usambarensis* Engl.—native name "Kirundo") in Uganda upwards of 150 ft. high the bark of which affords a whitish cloth used by the natives, but considered inferior to the Ficus-bark cloths; trunks made into beer-vats.

Treculia, Decne.

Treculia africana, *Decne*; Fl. Trop. Afr. VI. Sect. 2, p. 226.

Ill.—Ann. Sc. Nat. Paris, Series 3, viii. t. 3; Bot. Mag. t. 5986; Hook. Ic. Pl. t. 2353 (*T. affona*); Engl. Monogr. Afr.

Pflan. *Moraceae*, tt. 12–13 & 14 f. B; De Wildeman & Durand, Ill. Fl. Congo, t. 70 (*T. Dewevrei*); Engl. & Drude, Veg. Erde, ix. p. 657, f. 570.

Vernac. names.—Ogua (Onitsha, *Barter*); Ogue (Eboe, *Barter*); Afon (Oloke-Meji, *Foster*); Affon (Yoruba, *Millson*); Okwa or Ocua (Senegambia, *Welwitsch*); Oqua (Kroo, *Vogel*); [Dizanba (Golungo Alto), Isa, Isaquente, Quicange (St. Thomas) Amendoas de Disanha (Portuguese) *Welwitsch*].—African Bread Fruit.

Lagos, Onitsha, Oloke-Meji, and also found in Senegambia, Sierra Leone, Liberia, Cameroons, Gaboon, Angola, Belgian Congo, Nile Land and Nyasaland.

The fruit is remarkable for its size—weighing 18–30 lb., the seeds of which about the size of haricot beans are ground and used as meal, Lower Niger (Barter, Herb. & Mus. Kew); the fruits are stated to be poisonous to horses (Foster, Herb. Kew, No. 150, 1907; Kew Bull. 1894, p. 360), sheep and goats, but are the favourite food of elephants.

For use as food the fruits are placed in heaps and fermented, the seeds afterwards gathered, ground into a paste and cooked, by frying in palm-oil (Kew Bull. l.c. *T. affona*). Investigations made on the leaves and fruit, at the Imperial Institute do not bear out the opinion as to the tree being poisonous to animals (Bull. Imp. Inst. 1915, pp. 64–65). Welwitsch has estimated that there are 1500 seeds—as large as those of *Pinus Pinea*, Linn. the "Stone Pine" [Welwitsch probably used this comparison because the seeds of the "Stone Pine" are commonly sold in the markets of Lisbon for food] and not dissimilar in taste, sometimes boiled, sometimes roasted or prepared like sweet-meats and eaten by the Negroes and the Colonists, Golungo Alto, Angola: and a kind of "Almond milk" is also made from them, a refreshing drink in hot countries and during fever (Hiern, Cat. Welw. Afr. Pl. i. p. 1023).

A tree upwards of 80 ft. high, trunk 1–2 ft. in diam. at the base.

MYRIANTHUS, P. Beauv.

Myrianthus arboreus, *P. Beauv.*; Fl. Trop. Afr. VI. Sect. 2, p. 231.

Ill.—Pal. de Beauv. Fl. Oware & Benin, i. t. 11; Engl. Monogr. Afr. Pflan. *Moraceae*, t. 16, p. 39, f. 3 (wood structure).

Vernac. names.—Ibishere (Yoruba, *Millson*); Ihege (Benin, *Thompson*, *Unwin*); Sakpachi (Lapai, N. Nigeria, *Yates*); Ndisok (Old Calabar, *Holland*); Fofui or Fofoi (Sierra Leone, *Lane Poole*, *Scott Elliot*); Yankoma (Ashanti, *Chipp*); Musibiri, Musuviri or Musabiri (Golungo Alto, *Welwitsch*); Pernambuco (Pungo Andongo, *Welwitsch*).

Yoruba, Benin, Cross River, Old Calabar, Onitsha, in S. Nigeria; Lapai, N. Nigeria and widely distributed in West Africa—Sierra Leone to the Cameroons; in the Gaboon, Angola, Uganda, Belgian Congo and East Africa.

Leaves used when young for soup, Yoruba (Millson, Kew Bull. 1891, p. 211); fruit eaten, Yoruba, Onitsha (Barter, Herb. Kew); edible, acidulous-sweet, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. i. p. 995). The compound fruit—yellow when ripe is edible so far as the juicy pulp surrounding the numerous seeds; but to get the full benefit from it, to the best of the writer's remembrance, it was necessary to suck each seed separately.

A tree of spreading habit, 30 ft. high at Onitsha, a small tree in the damp parts of the Yoruba forests (Barter, Herb. Kew); 15–20 ft. high, flowering February to March, Lapai, N. Nigeria (Yates, Herb. Kew); a small tree, fruiting in April, Cross River (MacLeod, Herb. Kew), 20–25 ft. high, trunk 1¼–2 in. in diam. at the base, very elegant, Golungo Alto (Hiern, l.c.).

Musanga, R. Br.

Musanga Smithii, *R. Br.*; Fl. Trop. Afr. VI. Sect. 2, p. 239.

Ill.—Hook. Ic. Pl. tt. 1306–1307; Engl. Monogr. Afr. Pflan. *Moraceae*, t. 18; p. 43, f. 4 (tree $\frac{1}{100}$ nat. size); Thompson, Col. Rep. Misc. No. 66, 1910, t. 24; Engl. & Drude, Veg. Erde, ix. t. 32; p. 660, f. 571.

Vernac. names.—Aga (Yoruba, *Thompson*, *Foster*); Uno (Eifik, *Thompson*); Oro (Brass, *Thompson*); Ogohen (Benin, *Unwin*, *Dennett*, *Farquhar*); Ote (Aburi, Gold Coast, *Johnson*); Ofika, Gorwi (Sierra Leone, *Unwin*); Ef-a-kar (Sierra Leone, *Clements*); Oeduema (Ashanti, *Hiern*); Gofe or Goffe (St. Thomé, *Engler*, *Welwitsch*); Kilimbela (Mukenge, *Engler*); Bombambo (Belgian Congo, *Nihoul*); Parasolier, Assan (Congo, *De Wildeman*); Kigere (Uganda, *Dawe*); Loho, Amoiya, Parasolier (Liberia, *Courtet*); Combo-Combo (Gabonais, *Courtet*).—Cork Wood, Umbrella Tree.

Benin and Lagos, in Nigeria and also found in Sierra Leone, Liberia, Gold Coast, Togoland, Cameroons, Fernando Po, Uganda, Gaboon, Angola, and the Belgian Congo.

Wood very light; used as cork and called "Corkwood" by Europeans on the Coast, W. Africa, (Mann, 1861, Mus. Kew); used by the natives for making doors, Uganda, (Dawe, Report Bot. Miss. Uganda, 1906, p. 57); white, very soft, density 0·262, used for light joinery work, Ivory Coast (Courtet, Agric. prat. pays chauds, x. 1, 1910, p. 458); weight 30 lb. per cubic ft. (specimen Mus. Kew, Johnson, Gold Coast), not recommended for shipment (l.c.) suitable for house-building, Island of St. Thomé (Hiern, Cat. Welw. Afr. Pl. i. p. 996); poles much used as rafters for native houses, Yoruba, where native hunters sometimes cut the roots to obtain water for drinking (Foster, Nig. Trees & Pl. p. 64).

A tree 60–80 ft. high, Semliki Forest, Uganda (Dawe, Herb. Kew), 40–80 ft. high, Fernando Po (Mann, Barter, Herb. Kew); Common on all old farms, S. Nigeria (Unwin, Govt. Gaz. S. Nigeria, Mar. 30th, 1906, p. 151); a very rapid grower and one

of the first to occupy abandoned farm-land, extensively used as a nurse in plantations further south (Thompson, Col. Rep. Misc. No. 51, 1908, p. 61); one of the most beautiful of forest trees" (Barter, l.c.); "the most ornamental tree of the forest," Uganda (Dawe, l.c. p. 23) and in general the tree is remarkable for its handsome appearance and quick growth.

Ref.—"The Reproduction of *Musanga Smithii*," in Kew Bull. 1913, p. 96.—"W. African Corkwood," Bull. Imp. Inst. 1921, pp. 10–13.

ARTOCARPUS, Forst.

Artocarpus incisa, *Linn. f.* Suppl. Pl. (1781), p. 411.

A tree, 30–40 ft. high, trunk 1–2 ft. in diam. bark exuding a milky juice. Leaves large—1–3 ft. long by about 1½ ft. broad, alternate, coriaceous, deeply lobed. Male flowers on a catkin-like receptacle, 10–16 in. long; female flowers in a globular head. Fruit ovate or globose, 4–6 in. diam., muricated in the seed-bearing variety, reticulated with more or less evenly-marked areolae—surface comparatively smooth, in the seedless variety. Seeds in the former, chestnut-like. The Botanical Magazine (1828—*seq.*) distinguishes these varieties as "*fructu seminifero*" and "*fructu apyreno.*"

Ill.—Rumpf, Amb. i. tt. 32, 33; Cook, First Voy. ii (1773) t. 11; Ellis, Bread-fruit & (Mangostan) (1775), Frontispiece; Forster, Gen. Char. Pl. t. 57 (*A. communis*); Sonnerat, Voy. Nouv. Guinée, tt. 57–60; Lam. Encycl. t. 744; Bligh, Voy. South Sea (1792) p. 10 (Sections of fruit); Plenck, Ic. t. 656; Tuss. Ant. ii. tt. 2, 3; Dict. Sc. Nat. t. 286; Bot. Mag. tt. 2869–2871; Desc. Ant. viii. t. 539; Schnizlein, Ic. t. 93; Burnett, Pl. Util. ii. t. 34B; Spach, Suites (Hist. Nat. des Végétaux) t. 130; Baillon, Adansonia, iv. t. 5; Ill. Hort. 1874, p. 32; Blanco, Fl. Filip. t. 267 (*A. Rima*), t. 457 (*A. Camangsi*); Vidal, Fl. For. Filip. t. 88B; Zippel, Ausl. Handels. Nährpfl. tt. 54–55; Queensland Agric. Journ. ii. April 1898, t. 14; Krieger, Neu-Guinea, t. 8; Baum, Bread Fruit (Plant World, 1903–04) tt. 26, 27, 29, 37; Tropenpfl. 1904, Beih. v. tt. 19, 20.

Vernac. names.—Barabutu (Hausa, *Dalziel*); Rima (New Guinea, *Sonnerat*); Rhymay (Ladrone Is., *Bligh*); Sukun—seedless var., Keluway-seeded var. (Singapore, *Ridley*).—Bread Fruit (seedless var.), Bread Nut (seeded var.).

Native of the South Sea Islands. Introduced to Tropical Africa, Asia, America, West Indies and Queensland.

The introduction to the West Indies is a well-known story, probably the first expedition of its kind specially equipped by the Government. The first expedition under Capt. Bligh in the "Bounty" (1787) was a failure but a second under the same Officer in the "Providence" was successful in landing (Jan. 1793) 550 plants (out of 1,150 less those lost on the way) at St. Vincent, the remainder going "to Jamaica with the exception of five destined for the Royal Gardens at Kew"

where they arrived the same year (Bot. Mag. l.c.); 530 plants for St. Vincent and 700 for Jamaica and Kew are quoted in Kew Bull. 1892, p. 95 and some particulars of the condition of the Jamaica plants are given in Kew Bull. 1903, p. 11—letter Mr. Henry Shirley to Sir Joseph Banks dated, Kingston, Jamaica, Dec. 20th, 1794. The St. Vincent plants were reported to have begun to bear in the following year (1794) (l.c.) and in Jamaica 1795 (Bull. Dept. Agric. Jamaica, iv. Feb. 1906, p. 45) in which Bulletin a letter from Stephen Fuller to The Honble. The Committee of Correspondence dated London, March 31st, 1795, is reprinted. In this letter Fuller mentioned that "as we owe the blessing of this introduction entirely to the King, I am sure you will think as I do that he has a peculiar right to the primities, the fruits first produced from those trees" and suggested sending "ten or twelve in number of the fruit, in a large jar, covered with strong rum, well corked, bound with leather and pitch and resin melted upon the cork." He further said "His Majesty knows me and has been pleased to express great satisfaction at the method I took two or three years ago to enrich his garden at Kew with a great number of Jamaica plants more than had been introduced there in twenty years before; I will consult Sir Joseph Banks upon it and we will endeavour to make it an agreeable present equally honourable to the maker and the receiver."

This fruit although not of such great importance to the Colonies as at first anticipated is nevertheless very valuable and forms an important article of food in most of the countries into which it has been introduced. In the South Sea Islands it is indispensable. It is about the size of and similar in appearance to a green melon, or as Dampier ("Voyage of Adventure," i. 1769) puts it "as big as a penny loaf when wheat is at five shillings the bushel"; he adds that "the natives of Guam use it as bread, gathering it when fully grown while it is green and hard and then baking it in an oven." It is usually regarded more as a vegetable and requires to be cooked before eating. The "bread-nuts" are boiled and eaten with salt and used by cooks for stuffing (Kew Bull. 1888, p. 210—Dominica). The fruit is cut into slices and baked in "Jinguba" oil—from the seed of *Arachis hypogaea* (*see* p. 201) in Angola (Hiern, Cat. Welw. Afr. Pl. i. p. 1022), sliced and sun-dried in Jamaica (Mus. Kew). Bread-fruit flour is described as an insipid non-saccharine substance which forms with fish and bananas the staple food of the Tahitians (Year Book, Pharm. 1903, p. 328). Powder prepared from the fruit in the Seychelles has been found to consist of practically pure starch—as much as 99·4 per cent. (Col. Rep. Misc. No. 71, 1910, p. 226). Boiled and pulped and mixed with phosphorus, the bread-fruit is recommended as a substitute for corn meal in a phosphorus preparation (a stick of phosphorus to 8 gallons of meal, mixed while hot) used for poisoning crabs —often serious pests in gardens near the sea and in swampy

land, St. Lucia (Agric. News, Barbados, May 6th, 1916, p. 155). The spikes of the male flowers are sometimes candied like the "Citron" and "Lemon" peel (l.c.) and sliced male flowers are used as tinder (Mus. Kew).

In its native countries clothes are made of the fibres of the liber or inner bark, the wood is used for building houses and making boats, the male catkins as tinder, the leaves for wrapping provisions and the viscid milky juice to make bird lime (Bot. Mag. l.c.).

Propagated by means of seeds in the case of the "Bread-nut" and suckers, layering or root cuttings of the "Bread fruit."

Ref.—A Voyage to the South Sea undertaken by command of His Majesty, for the purpose of Conveying the Bread-fruit to the West Indies in His Majesty's Ship the "Bounty," Bligh, pp. 1–264 (London, 1792).——"*Artocarpus incisa*" in Flora Vitiensis, Seemann, pp. 255–257 (London, 1865–73).——"L'Arbre à Pain," etc. in L'Illustration Horticole (J. Linden) xxii. 1874, pp. 32–34.——The Bread-fruit, *Artocarpus incisa* (True Bread-fruit)," Cowley, in Queensland Agric. Journ. ii. April 1898, pp. 299–301.——The Bread-fruit, Baum: together with a Biographical Sketch of the Author, by W. E. Safford—Reprint from "The Plant World," Vol. vi. & vii. 1903–04, pp. 197–278 and 36–40.——"Starch prepared from the Bread-fruit Tree in the Seychelles," in Bull. Imp. Inst. ii. 1904, pp. 28–29, with analysis of Starch.——*Ibid.* in Col. Rep. Misc. No. 71, 1910, pp. 225–227. ——"Propagation of the Seedless Bread-fruit," Wester in "The Philippine Agric. Review," viii. No. 3, 1914, pp. 97–99.

Artocarpus integrifolia, *Linn. f.* Suppl. p. 412.

A large evergreen tree, 60 ft. high. Leaves 4–8 in. long, coriaceous, dark-green; petiole $\frac{1}{2}$–1 in. long. Fruit 1–2 ft. or more long; less across. Seeds numerous, oblong or reniform, about an inch long, not quite so broad, with a papery testa when dry.

Ill.—Rheede, Hort. Mal. iii. tt. 26–28; Rumpf, Amb. i. tt. 30, 31; Gaertner, Fruct. Sem. Pl. i. tt. 71, 72 (*Sitodium cauliflorum*); Lam. Encycl. t. 745; Tuss. Ant. ii. t. 4; Roxb. Pl. Corom. iii. t. 250; Bot. Mag. tt. 2833–2834; Wight, Ic. Pl. Ind. Or. ii. t. 678; Gard. Chron. Dec. 12th, 1896, p. 717, f. 125; L'Agric. prat. pays chauds, viii. 1, 1908, p. 117; Queensland Agric. Journ. xx. 1908, tt. 29–30; Journ. Indian Art & Industry, xiii (1910), t. 25 (tree in fruit), tt. 43, 44, 46 (col. ill. of wood); Journ. Hort. lx. 1910, p. 195; Hubert, Fruits pays chauds, f. 183 (fr. stem).

Vernac. names.—Jaca or Jacca (St. Thomé, *Welwitsch*); Jack Tree, Jack Fruit or Entire-leaved Bread Fruit.

Native of S. Asia: Cultivated in India, West Indies, Tropical Africa and in most tropical countries.

The fruits—sometimes 60 or 70 lb. in weight (Kew Bull. 1892, p. 99) are commonly eaten as food—in Zanzibar (l.c. p. 89);

pulp preserved as a sweetmeat, Singapore (Col. & Ind. Exhib. 1886); Dominica, where in 1888 only a few trees were growing; fruit not much cared for by the people, seeds eaten like the Bread-nuts (*A. incisa*) (l.c. 1888, p. 210), in India and generally everywhere in countries where the tree has been established.

The wood is valued in Zanzibar as being almost the only native timber soft enough to be easily worked (Kew Bull. 1892 p. 89); used for carpentry, furniture and boxes, India (Gamble, Man. Ind. Timb. p. 653) and for cabinet-making and brush-backs in Europe (l.c.; Stone, Timb. Comm. p. 206); also used to dye the yellow clothes worn by the Buddhist priests, in Burma (Gamble, l.c.).

This yellow dye may be dyed on cotton on alumina mordant; the shades obtained are good and fast (Srivastava, Agric. Journ. India, "The Dyeing Value of Some Indian Dye-stuffs," Special Indian Science Congress Number, Calcutta & London, 1916).

A fibre is made from the inner bark—specimens in the Kew Museum from Jamaica and Mauritius.

Propagated by seeds; the flowers and fruit are developed on the hard wood—trunk and branches, after the manner of Cacao. The tree is grown in the West Indies as a shade tree for Coffee (*see* p. 368), affords excellent shade for stock in pastures (Agric. News, Barbados, ii. Oct. 24th, 1903, p. 342) and suitable for wind-belts (Macmillan, Trop. Pl. & Gard. p. 376).

Ref.—"Jaca or Jack-Fruit (*Artocarpus integrifolia*)," in Cultural Industries for Queensland, Bernays, pp. 111–112 (Govt. Printer, Brisbane, 1883).——"Hassan Jack Fruit," Morris, in Gard. Chron. Dec. 12th, 1896, pp. 717–718.——The Constituents of *Artocarpus integrifolia*, Perkin & Cope, Agric. Ledger, No. 4, 1896, pp. 1–7.——"The Jack Tree, *Artocarpus integrifolia*, in Timbers of Commerce, Stone, pp. 205–206 (William Rider & Son, Ltd. London, 1904).——"Jaquier (*Artocarpus integrifolia*)" in "Trois Artocarpées Utiles," Desruisseaux, in L'Agric. prat. pays chauds, viii. 1, 1908, pp. 116–125.——"*Ibid*," in Fruits des pays chauds, Hubert, pp. 515–527 (H. Dunod et E. Pinat, Paris, 1912).

Artocarpus nobilis, *Thw.* Enum. Pl. Zeyl. p. 262.

A large tree 40–50 ft. high, up to 12 ft. in girth. Leaves 6–12 in. or so across, scaberulous on both surfaces; on young plants pinnatifid, nerves about 9 pairs; petiole $\frac{3}{4}$–$1\frac{1}{2}$ in., stout. Flower heads erect, oblong, peduncles 3 in., stout. Fruit 6–8 in. by $3\frac{1}{2}$–4 in. diam. Seeds $\frac{1}{2}$ in. diam. sub-globose (Fl. Br. India v. p. 543).

Ill.—Bedd. Fl. Sylv. t. 309; Ann. Bot. Gard. Calcutta ii. 1889, t. 10.

Vernac. names.—Wal-del, Asinipalla-Kai (Ceylon, *Macmillan*); Del (Ceylon, *Thwaites, Beddome*).—Wild Bread-fruit (Ceylon).

Native of Ceylon; introduced to Old Calabar from Kew.

Timber of good quality, much used for furniture and boats are hollowed out of single trees (Beddome, Fl. Sylv. p. 399).

Fruit eaten by the Natives as a vegetable in curries, &c.; and the seeds are also roasted and eaten, Ceylon (Macmillan, Trop. Pl. & Gard. p. 128).

Propagated by seed and apart from the uses mentioned the tree may be recommended for ornament and shade.

Urera, Gaud.

Urera obovata, *Benth.*; Fl. Trop. Afr. VI. Sect. 2, p. 257.

Vernac. name.—Esinagbonom (Lagos, *Lamborn*).

Lagos, Abeokuta in S. Nigeria, and also known from Sierra Leone.

The leaves, which are highly urticating are macerated in water and the aqueous extract taken as a cure for dysentery, Lagos (Lamborn, Herb. Kew).

A dioecious climbing shrub.

Var. **Quintasii,** *Engl.*; l.c. p. 258.

Cameroons and Princes Island.

Fish-snares made from the bast fibre.

Boehmeria, Jacq.

Boehmeria nivea, *Hook & Arn.* in Bot. Beech. Voy. p. 214.

Herbaceous perennial; stems 3–6 ft. Leaves broadly ovate, serrate 3–6 in. across, green, scabrid above, white-downy below; petioles long—6 in., branching near the base of the blade into 3 prominent hairy, brown midribs on the under side—less so on the upper side, from which less prominent ribs branch off at an angle of about 45° and again from these finer veins arise at right angles or nearly so. Inflorescence paniculate, bearing many almost sessile clusters of nettle-like flowers.

Ill.—Jacquin, Hort. Bot. Vindob. t. 166 (*Urtica nivea*); Hooker, Kew Journ. Bot. iii. 1851, t. 8; Weddell, Monogr. *Urticaceae*, t. 11, ff. 10–17; Wight, Ic. Pl. Ind. Or. ii. t. 608 (*Urtica tenacissima*); Vidal, Fl. For. Filip. t. 89c; Christy, New Comm. Pl. & Drugs, No. 7, 1884, p. 38; Journ. Agric. Hort. Soc. India, viii. 1890, t. 2; Agric. Gaz. N. S. Wales, ix. 1898, p. 1296; xviii. 1907, p. 744 (field of Ramie at Wollongbur Farm); Agric. Ledger, No. 15, 1898, t. 1; Tropenpfl. x. 1906, p. 82; Queensland Agric. Journ. xviii. 1907, p. 28, t. 5 (field of Ramie in Rhodesia); t. 6; Natal Agric. Journ. x. 1907, p. 1527 (Ramie at Bayre's Drift); Agric. Journ. India, 1907, t. 1; Agric. Col. ii. 1908, t. 4.

Vernac. name.—Tchou Ma (China, *Morris*, *Watt*);——China Grass, Rhea; Chinese Grass Cloth Fibre.

Native of China. Cultivated in temperate and the cooler parts of some tropical countries, including Japan, Formosa,

Philippine Islands, Burma, India, Australia, America and Europe (Watt. Agric. Ledger, l.c. p. 12).

Var. **tenacissima.**

Similar in general botanical characters to the type excepting the leaves, in which the white-felted appearance of the underside is absent.

Ill.—Blanco, Fl. Filip. t. 385 (var. *candicans*); Blume, Mus. Bot. Lagduno-Batavum, ii. t. 56, f. B; Agric. Ledger, No. 15, 1898, t. 2 (*B. tenacissima*); Queensland, Agric. Journ. xviii. 1907, t. 6.

Vernac. names.—Ramie or Rami (Malay, *Morris, Watt*).—Green-leaved China Grass.

Native of Malaya. Cultivated in various tropical countries. For all practical purposes the two plants although distinct botanically, and requiring different climates, are approximately the same, and the following details may apply to both; but refer more particularly to the tropical plant. Moreover, in Malaya, Mr. H. N. Ridley found that the white-leaved (*nivea*) plant after 2–3 seasons developed green-leaves (*tenacissima*).

In 1897 roots were sent from Kew to Old Calabar and in 1907 it is reported that a " plot planted last year still kept on " at Old Calabar (Rep. Bot. St. Old Calabar, June Quarter; Govt. Gaz. S. Nig. Aug. 28th, 1907). In 1906, 3 lb. of seeds of *Boehmeria nivea* (Ramie) were purchased from Messrs. Christy & Co. for the Western Province (Col. Rep. Misc. No. 51, 1908 (for 1906) p. 90) and at Oloke-Meji experiments in the cultivation were reported as being continued and promising good results (Thompson, Govt. Gaz. S. Nig. Dec. 11th, 1907, Suppl.) and that " considerable attention has been devoted to " this valuable fibre; an unlimited quantity will be available " next year, native planters are being persuaded to take it up." In 1910 Ramie Roots were offered by the Agricultural Department at Ibadan at 6*d*. per 100 (Govt. Gaz. S. Nigeria, Nov. 30th, 1910). Samples of fibre grown in the gardens have been forwarded to manufacturers for valuation (Williams, l.c. Dec. 11th, 1907, p. 16). A sample (sent by Farquhar, Dec. 24th, 1907) of degummed fibre was reported as " of good quality, but not in the form required for the market, as manufacturers prefer to buy the ribbons and degum the fibre themselves " (l.c. July 15th, 1908, p. 2). Fibre of good length has been prepared by hand in the native way—beating—at Warri (Copland-Crawford, Ann. Rep. Cent. Prov. S. Nig. Dec. 1910, p. 21).

In other parts of Africa experiments have been made with indifferent success—Sierra Leone, " grows well during the rainy season, but the long period of dry weather is detrimental to it " (Dudgeon Agric. & For. Prod. W. Afr. p. 31), Nyasaland—cultivation altogether unsuited to the climatic conditions (Bull. Imp. Inst. 1909, p. 41), in British East Africa where the Agricultural Department has imported a large number of plants

from India, the crops have been very good, notably in the Nairobi and the Kikuyu districts, especially when grown in damp localities or in irrigated fields; but ribbons not exported to any extent (up to 1906), and experiments in degumming and decortication being carried out (l.c. 1906, p. 276), receiving considerable attention and shows signs of doing well with a prospect of a considerable future, if the decorticating and degumming could be overcome and the demand proved large and consistent (Col. Rep. Ann. No. 519, 1907, p. 18), about 70 acres at Pangani (G. E. Africa), but here as elsewhere the industry is retarded by want of a suitable decorticating machine (Bull. Imp. Inst. 1903, p. 132), experiments have been carried on to a noteworthy extent in Aruscha (G. E. Africa) (l.c. 1915, p. 125). Ramie fibre from the Belgian Congo (1917) was reported as being 3–4 ft. long, of poor lustre, not readily saleable in Europe as manufacturers prefer to degum the fibre themselves, but that it should be saleable in the form of scraped ribbons, similar to those of Commercial " China Grass " (l.c. 1917, p. 493).

The above instances are but a few of the many that could be quoted as to experiments in nearly every British Colony and in certain Foreign Countries, and in general the situation seems to have undergone little alteration since 1895 when it was stated—" for more than 50 years it has been sought to cultivate the plant and to extract the fibre on a commercial scale, China Grass is still, however, in the stage of expectancy and purely experimental plots are common everywhere (Morris, Journ. Soc. Arts, xliii. 1895; reprint p. 10). The main difficulties that appear from the outset to have been met with are comparatively high cost of cultivation—the yield of useful fibre from the stalks being comparatively lower than that of other textile fibres—degumming, inflammability, and low market prices. Various methods have been put forward from time to time for cleaning the fibre—machinery, chemical, by the aid of steam, Bacteria, and Petroleum soap, [*see* Kew Bull., Works by Watt, Coventry, Carter, Goulding, &c. *seq.*] In China, from whence our chief commercial supplies of fibre come, the preparation is all done by hand—the bark is stripped off into ribbons which are retted (for 2 hours in water) scraped and dried. It afterwards receives no further treatment beyond sorting for length; but for baling shippers at Hankow and Shanghai use hydraulic presses and fibre exported from these ports, may be so treated before being re-shipped. There are three qualities determined by the length of fibre—first quality 30–40 in., second quality 20–30 in. and third quality less than 20 in.; the fibre is tied up in bundles, a rope of the Ramie itself being used as a binder (Cons. Rep. No. 5309, 1914, " Trade of Kiukiang, p. 9).

In the Trade returns the quotations are for " Rhea " and " China Grass "—the former " decorticated ribbons " and the latter " unbleached or more or less cleaned fibre " (Watt, Agric. Ledger, No. 15, 1898, p. 9) or in other words the fibre appears

in the form of hand-cleaned or machine-cleaned fibre, when it is known as China Grass or more rarely in the form of strips with bark and woody matter adherent to them and known as Rhea, or Ramie, ribbons (Rep. Inter. Exhib. Brussels, Rome, Turin, 1910 & 1911, p. 323)—the London market report for "China Grass" (1913) was "Quotations 40*s*. to 55*s*. [per cwt.] at which but little business can be done" (Mon. Circ. Ide & Christie, Jan. 15th, 1913) and (1919), "Continues in good demand and stocks diminishing: Value [per ton] £95 to £120" (l.c. Dec. 15th, 1919); but for "Rhea" the report of this reputable firm in their monthly circulars from January 1904 to December 1919 has almost invariably been "no stock" or "no business."

The fibre is used for the manufacture of "Grass Cloth" in China and for various purposes, similar to those of linen and cotton, and incandescent gas mantles, in Europe.

May be propagated from seed, layering, cuttings and division of the roots, the last-mentioned being the best method. Rich well-drained soil is essential, with continual applications of manure during the whole life of the plantation, which under favourable conditions may last many years giving two or three crops a year. Failing intensive culture the only way to keep the plants vigorous is to re-plant new areas as the soil becomes exhausted.

Full particulars as to cultivation, preparation of the fibre &c. are given in the Kew Bulletin, "Fibres" and other works mentioned below.

Ref.—"Ramie (*Boehmeria nivea*)," Kew Bull. 1888, pp. 145–149; pp. 273–280; pp. 297–298; 1889, pp. 267–278; pp. 284–287. ——"Ramie as food for Silkworms," l.c. 1890, pp. 174–175.——"Paris Ramie Trials 1891," l.c. 1891, pp. 277–278.——"Ramie Machine Trials at New Orleans," l.c. 1892, pp. 304–306.——"China Grass: 1891 Onwards," l.c. 1898, pp. 209–224; Reprinted in Kew Bull. Add. Ser. II. "Vegetable Fibres" (1912) pp. 52–95.——Traite, Scientifique et Industriel de la Ramie, Micholte, pp. 1–360: App. pp. 1–107 (Lib. Centrale des Sciences, Paris, 1891).——Recent Facts regarding the Ramie Industry in America, Dodge, U.S. Dept. Agric. Fiber Investigations, Rep. No. 2, 1891, pp. 1–16.——Rhea Fibre and On the Rewards formerly offered by the Govt. of India for Machinery to be employed in Its Separation. Watt, Agric. Ledger, No. 6, 1894, pp. 1–7.——Report on the Cultivation of Ramie in the United States, Dodge U.S. Dept. Agric. Fiber Investig. Rep. No. 7, 1895, pp. 1–63.——"Ramie" in Cons. Rep. Misc. No. 401, 1896, Mexico, pp. 21–24.——Rhea (Riha) or China Grass, Watt, Agric. Ledger, No. 15, 1898, pp. 1–129; *Ibid.* l.c. No. 18, 1900, pp. 191–194.——Le Congrès International de la Ramie, Paris 1900, in Revue des Cult. Col. vii. July, Aug. Oct. and Nov. 1900; *Ibid.* pp. 1–107, ff. 14 (Bureaux, Revue Cult. Col. Paris, 1901).——"Ramie, Rhea, China Grass," Baxendale, in Agric. Bull. Fed.

Malay States, i. 1902, pp. 507–509.——"China Grass; Its Past, Present and Future," Birdwood, in Journ. Soc. Arts. lii. March 25th, 1904, pp. 395–409.——"Ramie, Rhea, or China Grass," Bull. Imp. Inst. iii. 1905, pp. 55–59.——"Ramie, Rhea, China Grass," Bull. Dept. Agric. Jamaica, iv. Dec. 1906, pp. 285–304.——"Rhea Experiments in India," Coventry, in Agric. Journ. India, ii. Jan. 1907, pp. 1–14, pls. i.–vi.——"*Boehmeria nivea*," in Comm. Prod. India, Watt. pp. 143–160 (John Murray, London, 1908).——"Ramie," in Col. Rep. Misc. No. 58, 1909, pp. 20–24.——Ramie (Rhea) China Grass: The New Textile Fibre, Carter, pp. 1–140 (Tech. Pub. Co. Ltd. Chancery Lane, London, 1910).——"Ramie Wool," Agric. News, Barbados, Oct. 29th, 1910, p. 344, from Trop. Agric. Aug. 1910, p. 108.——"Ramie," in Report of His Majesty's Commissioners for the Inter. Exhib. at Brussels, Rome and Turin, 1910–11, pp. 323–325 (Ballantyne & Co. Ltd. London)——Ramie, Dewey, U.S. Dept. Agric., Bur. Pl. Industry, Circ. No. 103, 1912, pp. 1–9.——"Note sur la Ramie," Paynaert, in Bull. Agric. Congo Belge, v. June 1914, pp. 322–330.——"Ramie, Rhea or China Grass" in Cotton and other Vegetable Fibres, Goulding, pp. 124–129 (John Murray London, 1917).

CASUARINEAE.

Casuarina, Linn.

Casuarina equisetifolia, *Linn.* Amoen. Acad. iv. p. 143.

A tree 40-60 ft. high, evergreen, trunk straight in avenues or under protection; but liable to become gnarled and twisted in exposed situations. Male spikes about ½ in., female peduncled. Fruit ¾ in. diam. with about 12 rows of puberulous achenes (Fl. Br. India, v. p. 598).

Ill.—Rumpf. Amb. iii. t. 57; Lam. Encycl. t. 746; Lodd. Bot. Cab. t. 607; Schnizlein, Ic. ii. t. 86; Vidal, Fl. For. Filip. t. 91; Safford, Pl. Guam (Contr. U.S. Nat. Herb. ix. 1905), t. 41 (Male & Female fl. & fruit).

Beefwood, Polynesian Ironwood, Swamp Oak, She Oak, Bull Oak, Forest Oak, Filao Wood (Mauritius), Cedre ou Filao (Seychelles).

Native of the Andaman Islands; in the island of Little Andaman, where the tree is plentiful on the coast, the Andamanese name for the island is said to mean "Casuarina Sand" (Prain, Proc. Asiat. Soc. Bengal, Dec. 1891, p. 157) and in N. Andaman, a bay where the tree is plentiful, is distinguished as "Casuarina Bay" (l.c. 1890, p. 242). Distributed to the Malay Islands, Pacific and Australia; cultivated in India, Mauritius, West Indies, &c.

At Lagos, for the March Quarter 1899, it was reported that the seeds supplied by the Royal Gardens, Kew, had succeeded and the tree thrived luxuriantly along the sand beaches near the sea (Kew Bull. 1891, p. 47, *C. muricata*).

In 1892 it was reported that during the previous two years efforts had been made to establish this tree on the West Coast of Africa, large supplies of seed being received through the India Office from the Agri. Horticultural Soc. of Madras and distributed from Kew to all the West African Settlements (Kew Bull. 1892, p. 73).

In 1891, trees on the embankment at Lagos were stated to be laden with fruit and could be multiplied to any extent, and at the Botanical Station, Gold Coast, 5000 young plants were on hand (l.c. 1893, p. 25).

At Aburi, Gold Coast, in 1910, the tree was doing well and its development was recommended for re-afforesting the Accra Plains, for the first stages in creating wind-breaks along the exposed sea-coast, and for firewood (Thompson, Col. Rep. Misc. No. 66, 1910, p. 14). In 1918 in the Southern Provinces, Nigeria, the plantations of forest trees covering an area of 828 acres were mostly planted up with this tree together with Teak, Mahogany, *Albizzia Lebbek*, and "Afara" (*Terminalia superba*), the growth of all species on the whole being reported as excellent (Col. Rep. Ann. No. 1030, 1920 (for 1918) p. 9).

Timber heavy—green wood on an average, weighing 70 lb. and seasoned wood 50–60 lb. per cubic ft.—hard, difficult to work, that of the Malabar coast plantations used chiefly for fuel; but some of it for poles and rafters (Gamble, Man. Ind. Timb. p. 666); used like "Teak" (*Tectona grandis*) for making drying sheds for tobacco in Sumatra (Journ. D'Agric. Tropicale, 1912, p. 270), for making clubs or mallets to beat out the bark of the "Paper Mulberry" (*Broussonetia papyrifera*) in Fiji (Mus. Kew), for making spears and war clubs in Samoa, and for fuel in Guam (Safford, Pl. Guam, p. 220). In the plantations of the North Kanara Coast, India, the tree is grown entirely for the fuel it yields, which is excellent, the wood will burn well even when green (Indian Forester, 1913, p. 143) and in Mauritius the majority of sugar factories burn considerable quantities of "filao" wood (Inter. Sugar Journ. 1910, p. 15).

The bark is used for tanning and for various medicinal purposes in India (Watt, Dict. Econ. Prod. India), formerly used by South Sea Islanders to dye their cloth (Maiden, Useful Nat. Pl. Australia, p. 294) and in the Kew Museum there is a piece of cloth dyed with the bark from Pondicherry (Dr. Cleghorn)—the cloth is "madapollam," colour Khaki.

The tree is valuable for shelter-belts, reclaiming sand-wastes and for ornamental purposes.

Propagated by seed, which germinates quickly; raised in Nursery beds or bamboo pots, the young plants may be ready for planting out in from 6–8 months, the distance apart should be from 5–10 ft. with periodical thinning as required. The growth is very rapid, 40–50 ft. with a girth of about 18 in. at a few feet from the ground in 4½ years, has been recorded (Indian

Forester, 1913, p. 141) and it thrives in poor sandy soil influenced by the sea.

Ref.—Report on the Measurement of Rates of Growth of *Casuarina* in the Nellore District, Hutchins, pp. 1–58 (Govt. Press, Madras, 1884) and note in Indian Forester, x. Nov. 1884, pp. 518–522.——" *Casuarina equisetifolia*," the Beefwood of Australia, in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 230–231.——" Treatment of Casuarina on Sand-dunes," Wallinger, in The Indian Forester, xxi. 1895, pp. 414–415.——" Note on Casuarina Planting," Popert, l.c. xxii. 1896, p. 8.——" *Casuarina equisetifolia* " in Manual of Indian Timbers, Gamble, pp. 665–666 (Sampson Low, Marston & Co. London, 1902).——A Memorandum of *Casuarina equisetifolia* : Its Cultivation and Treatment, with special reference to the Planting of Abandoned Mining Land in the Fed. Malay States, Hudson, in Agric. Bull. Straits and F.M.S. iv. Jan. 1905, pp. 11–18.——" A Description with Notes on the Working of the Casuarina Plantations of the North Kanara Coast," Miller, in The Indian Forester, xxxix. March 1913, pp. 141–149.——" Casuarina Plantations in the Kolaba Division," Rebeiro, l.c. Aug. 1913, pp. 380–383.——" Progress of the Casuarina Plantations in Western Division, Kanara," Marjoribanks, in The Indian Forester, xliii. 1917, pp. 128–132.——" Casuarina Woods in Mauritius," Agric. News, Barbados, xviii. Feb. 22nd, 1919, p. 51.

MONOCOTYLEDONS.

HYDROCHARIDEAE.

VALLISNERIA, Linn.

Vallisneria spiralis, *Linn.*; Fl. Trop. Afr. VII. p. 5.

Ill.—Hook. Bot. Misc. iii (1833) tt. 22–24; Journ. Roy. Hort. Soc. xlviii. pp. 536–537 and numerous other works.

Vernac. names.—Sáwala, Syala, Punatsu Panchu-dub (India—*Watt*).

Lagos (Barter, No. 20163, Herb. Kew), in other parts of Africa—Nile region, Congo, Lake Nyasa, and commonly found throughout the warm parts of the globe.

The moist, succulent leaves are used in India to cover the surface of sugar in the native process of refining (Watt, Dict. Econ. Prod., India).

This plant is also mentioned here because of its scientific interest. It is an aquatic plant commonly grown in aquaria in this country, remarkable for its method of fertilisation—the male flowers become detached from their short stalks below water and rise to the surface before expanding to release the pollen, and the female flowers are borne on long stalks that expand spirally to the surface of the water, where they are fertilised by the floating male flowers, when the spiral stalk coils up again to ripen the berries below water near the base of the plant—and as an object for microscope—the leaves showing cyclosis of the chlorophyll or protoplasmic granules. Barter collected his specimen in a lagoon.

ORCHIDEAE.

VANILLA, Sw.

Vanilla planifolia, *Andr.* Bot. Rep. (1808) t. 538.

A climber, clinging by means of aerial roots. Leaves succulent, shortly petioled, bright green, about 6 in. long, 2 in. broad, apex acute. Inflorescence an axillary raceme, each raceme bearing upwards of 20 large greenish-coloured flowers. Pods 3–8 in. long, slender, developing on the surface the Vanillin crystals and the well-known perfume when dried for commerce.

Ill.—Salisbury, Parad. Lond. t. 82 (*Myrobroma fragrans*); Andr. Rep. t. 538; Loddiges. Bot. Cab. t. 733; Blume, Rumphia, i. t. 68. f. 2; L'Hort. Universel, Paris, i. 1839, p. 169 t. 23; Hayne, Darst. Beschr. Gewächse, xiv. t. 22; Berg & Schmidt, Darst. Beschr. Pharm. iii. t. 23ab; Bentl. & Trimen, Med. Pl. t. 272; Köhler, Med. Pflan.; Zippel, Ausl. Handels Nährpfl. t. 12; Kew Bull. 1888. p. 79; Bot. Mag. t. 7167; Gard. Chron. April 8th, 1899, p. 213 (in fruit); Proc. & Journ. Agric. Hort. Soc. India, Oct.–Dec. 1902, p. 124 (from Kew Bull. l.c.); Orchis, v. 1910, t. 2; L'Agron. Col. Paris, ii. 1914, p. 4; iii. 1914, p. 12.

Vanilla.

Native of Mexico. Cultivated in Seychelles, Mauritius, Réunion and other French Colonies, Tahiti, Fiji, British West Indies and West Africa.

Vanilla is well known for its use in confectionery as a flavouring agent. At the end of the 17th cent. it was imported into France through Spain, used for flavouring chocolate and scenting tobacco (Bot. Mag. l.c.) and it formerly had a place in the British Pharmacopoeia.

" Vanillons "—wild or uncultivated—are collected in Guadeloupe, Martinique, Mexico, &c., and imported chiefly for use among tobacco manufacturers and perfumers, for the manufacture of sachet powders (Kew Bull. 1892, p. 214).

The chief commercial sources are Seychelles, Mauritius, Réunion, Bourbon, Comoro Islands, Madagascar, Fiji, Java, Ceylon, Guadeloupe, Martinique, Mexico, Tahiti; the total production of these countries amounting in 1910 to 575 tons (Trop. Agric. xxxvii. July 1911, pp. 37–38), in which year Seychelles " good long " realised 14*s.* per lb., Ceylon " fair to good medium " 13*s.* 6*d.*; " common split-short " 9*s.* 9*d.*, and " inferior qualities " 8*s.* 9*d.*–11*s.* per lb. on the London market (Agric. News, Barbados, Sept. 17th, 1910, p. 295).

The prices ruling for Réunion in 1912 averaged for all qualities, 33 fr. 50 c. (£1 6*s.*) per kilo (2·2 lb.) (Chem. & Druggist, July 19th, 1913, p. 96); and at the present time (1920) for Seychelles—fair to good firsts, 7–8 in. 13*s.* 6*d.*–15*s.*; 6–7 in. 11*s.* 6*d.*–13*s.*; 3½–6 in. 10*s.*–12*s.*; for firsts, leanish, 3½–6 in. 9*s.* 6*d.*; foxy, 5–6 in. 9*s.* 3*d.*; good to fine split, 9*s.*–12*s.*; and brown and split, 8*s.*–9*s.* 6*d.* per lb. (l.c. April 3rd, 1920, p. 466): Vanillin at the same time was 80*s.* per lb. (l.c.).

The Mexican vanilla is the finest; it formerly went largely to France, but later more to the United States (New York) market (U.S. Cons. Rep. Sept. 1891, p. 127: Kew Bull. 1892, p. 212).

Vanillin—the aromatic constituent of Vanilla—is produced artificially on a commercial scale, made largely from eugenol obtained from oil of cloves as the raw material. It has also been obtained from sugar (Agric. News, Barbados, 1904, p. 103). Two samples of clove oil and three of clove leaf oil from Mauritius were found to be of good quality and to contain a high percentage of eugenol that would find a ready sale (1914) in Europe for the preparation of Vanillin (Col. Rep. Ann. No. 882, 1916, p. 22). About 75 grams of artificial Vanillin replace 1000 grams of good Vanilla (Perf. & Ess. Oil Rec. Sept. 23rd 1919, p. 247) and when it first appeared on the market (1876) the price was £160 per lb., reducing year by year until in 1906 it was at 18*s.* per lb. (see Parry, Chem. Ess. Oils & Art. Perf. p. 473); in the same year Vanilla, Seychelles " good firsts " (7½ to 8 in. long) sold at 10*s.* 6*d.* to 13*s.* per lb. (Chem. & Druggist, Nov. 17th, 1906, p. 765): in the present year (1919) it is quoted at 80*s.* per lb. (l.c. Nov. 15th, 1919, p. 72). Although this product does not,

so far, appear to have superseded the Vanilla pod, it is a prospect worthy of consideration for cultivators. The preparation of the pod is an industry suited to the resources of small proprietors (Director, Kew, to Colonial Office, 18th Aug. 1885; Kew Bull. Jan. 1887, p. 5), and with this in mind also, cultivators will be well advised not to place entire reliance on it. The cultivation served a good turn in Réunion in 1850, when it was taken up on the failure of the Sugar Cane, and became the mainstay of the island (see Kew Bull. l.c.): but this was before the competition with "Vanillin," and although there is still a good market for "Vanilla," a similar success would perhaps now not be so certain.

In 1890 *Vanilla planifolia* was being grown at Abutshi, but Woodruff, at that time in charge of the Niger Company's Plantations there, reported that it had not been very successful (Kew Bull. 1891, p. 94).

The plant may be propagated by seed, but it is usually increased by cuttings: established in nursery beds they may be planted out in permanent places on supports about 9 ft. apart. Rich, light, well-drained soil, shade, protection from strong winds and a tropical climate with a good rainfall during growth are essential conditions. Various plants have been advised for support and shade, the choice depending largely on local conditions. Amongst those suggested are *Erythrinus* (see p. 214), *Bixa orellana* (p. 57), *Eriodendron anfractuosum* (p. 87), *Albizzia Lebbek* (p. 299), *Croton Tiglium* (p. 592), *Jatropha Curcas* (p. 593), and *Elaeis guineensis* (p. 734). Bananas and similar crops may be grown until the supports are large enough to furnish sufficient shade. Fertilisation of the flowers by hand appears to be necessary in most countries other than Mexico; plants begin to bear after 3 or 4 years, and each plant will bear many more flowers and fruits—according to number fertilised—than it should be allowed to carry, approximately not more than 50 per cent. of the pods may be left to mature; which may take from 4–6 months to ripen. The drying and curing require great care, and various processes by means of hot water, sun heat, or artificial heat, are resorted to in different countries: that with the aid of calcium chloride practised in Réunion is fully described in Kew Bull. 1898, pp. 43–46, and that in St. Kitts-Nevis—briefly, immersion in hot water (80° C. recommended), sweating at a moderate temperature (50° C. giving good results), drying slowly (about two weeks) at room temperature, and packing in air-tight tins—(Perfumery and Essential Oil Record, Nov. 1919, p. 306). Other processes, together with further particulars on the cultivation are given in the following works.

Ref.—"Vanilla," in Pharmacographia, Flückiger & Hanbury, pp. 657–660 (Macmillan & Co., London, 1879).——"Vanilla: Its Cultivation in India," O'Connor, pp. 1–25 (Supdt. of Printing, Calcutta, 1881).——La Vanille: Sa Culture et sa Préparation, Delteil, pp. 1–58; pls. i.–ii. (Challamel Hine, Editeur, Librairie Algérienne et Coloniale, Paris, 1884).——"Vanilla," in Kew Bull.

1888, pp. 76–80.——"Some Vanillas of Commerce," l.c. 1892, pp. 212–215.——"Vanilla Disease (*Calospora Vanillae*, Massee)," l.c. 1892, pp. 111–120.——"Cultivation of Vanilla in Tahiti," l.c. 1894, pp. 206–208, including "Area and Cost of Cultivation."——"Vanilla at Fiji," l.c. pp. 208–211.——"Vanillas of Commerce," l.c. 1895, pp. 169–178.——Vanilla of Mexico, Dering, Diplomatic & Consular Report, Misc. Series, No. 385, 1895, pp. 11–18.——"New Method of Drying Vanilla Pods," Kew Bull. 1898, pp. 43–46.——"Vanilla Culture: As Practised in the Seychelles Islands," Galbraith, U.S. Dept. Agric. Div. of Botany, Bull. No. 21, 1898, pp. 1–24, pl. i; Reprint in Proc. & Journ. Agric. Hort. Soc. India, Oct.–Dec. 1902, pp. 125–143.——"Artificial Vanilla," in The Agric. News, Barbados, iii. March 26th, 1904, p. 103.——"All about Vanilla," in All about Spices, Ferguson, pp. 149–184 (Colombo, 1905).——"Packing Vanilla for Shipment," Hamel-Smith, in "Tropical Life," 1908, p. 73.——"The Prospects of Vanilla Growing," Agric. News, Barbados, Feb. 19th, 1910, pp. 52–53.——"A Method of Pruning Vanilla," l.c. x. July 22nd, 1911, pp. 228–229.——"The Curing of Vanilla," l.c. xi. May 11th, 1912, pp. 148–149.——"Vanilla Preparation in Seychelles," l.c. xi, July 20th, 1912, p. 228.——"Production et Consommation de la Vanille dans les differents pays," Chalot, in L'Agric. prat. des pays chauds, xii. part 1, April, 1912, pp. 334–337.——"Vanilla" in Spices, Ridley, pp. 23–93 (Macmillan & Co., Ltd., London, 1912).——"Contribution a l'Etude de la Vanille," Advisse-Desruisseaux, in L'Agric. prat. des pays chauds, xiii. April, 1913, pp. 265–276.——"Culture de la Vanille à Madagascar," Fauchère, in Journ. d'Agric. Tropicale, xiv. April 30th, 1914, pp. 105–109; transl. in The Perfumery and Essential Oil Record, May 1914, pp. 152–154.——"Culture et Préparation de la Vanille," Chalot & Bernard, in L'Agronomie Coloniale, Paris, ii. 1914, pp. 1–8; pp. 36–41; pp. 81–85; pp. 111–116; pp. 144–149; pp. 175–182; iii. 1914, pp. 9–16; pp. 44–54; pp. 81–100; pp. 154–171; iv. 1918, pp. 18–24; pp. 45–56; pp. 72–90; iv. 1919, pp. 114–122; pp. 163–170; pp. 189–195; v. 1919, pp. 11–19; pp. 46–53.——"Vanillin and its Uses," Perfumery and Essential Oil Record, Sept. 23rd, 1919, pp. 247–248.——"Curing Vanilla," l.c. Nov. 25th, 1919, p. 306.

Amongst other Orchids in Nigeria of ornamental value only may be mentioned, *Bulbophyllum barbigerum*, Lindl.; Fl. Trop. Afr vii. p. 34; Bot. Mag. t. 5288: *Megaclinium maximum*, Lindl. l.c. p. 38; Bot. Mag. t. 5936 (*M. purpuratum*): *Eulophia euglossa*, Reichb. l.c. p. 57; Bot. Mag. t. 5561: *E. guineensis*, Lindl. l.c. p. 69; Bot. Mag. t. 2467: *Ansellia congoensis*, Rod. l.c. p. 102: *Angraecum Eichlerianum*, Kranzl. l.c. p. 143; Bot. Mag. t. 7813: *Listrostachys caudata*, Reichb. l.c. p. 153; Bot. Mag. t. 4370: *L. Chailluana*, Reichb. l.c. p. 153; Bot. Mag. t. 5589 (*Angraecum Chailluanum*): *L. Monteirae*, Reichb. l.c. p. 156; Bot. Mag. t. 8026: *L. pertusa*, Reichb. l.c. p. 161: Bot. Mag. t. 4782 (*Angraecum pertusum*): *Mystacidium distichum*, Benth. l.c. p. 175; Bot. Mag. t. 4145 (*Angraecum distichum*).

SCITAMINEAE.

Kaempferia, Linn.

Kaempferia aethiopica, *Benth.*; Fl. Trop. Afr. VII. p. 294.

Ill.—Schweinf. Fl. Aethiop. t. 1 (*Cienkowskia aethiopica*).

Vernac. name.—Limniyar Kwadi (Hausa, *Dalziel*).

Lagos, Lokoja, Zungeru, Zaria, Bornu, Ilorin in Nigeria, and found in the Gold Coast and East Africa.

Tubers eaten as a ginger-like spice, East Africa (Engl. Pflan. Ost. Afr. B. p. 265; root aromatic, River Rovuma (Kirk, Herb. Kew).

Large magenta or lilac coloured flowers, in stony ground, common, early rainy season, Lokoja (Parsons, Herb. Kew); common wild flower of Northern Provinces, flowers blue purple, begins to flower before the rains start and before the leaves appear (Lamb, Herb. Kew); flowers large purple, common in grassy plains from Oyo to Ilorin (Barter, Herb. Kew).

Costus, Linn.

Costus afer, *Ker*; Fl. Trop. Afr. VII. p. 299.

Ill.—Bot. Reg. (1822) t. 683; Bot. Mag. t. 4979.

Vernac. names.—Ka Ki Zuwa (Hausa, *Dalziel*); Achikka (Zungeru, *Dalziel*); Ukweroha (Benin, *Dennett*).——Smooth Sierra Leone Costus (Bot. Mag. l.c.), Bush Cane (Sierra Leone, *Scott Elliott*).

Old Calabar, Zungeru, Katsina Allah, Abinsi, Aboh (Lower Niger), &c., in Nigeria, and also known from the Cameroon River, Congo, Fernando Po, Gold Coast and Sierra Leone.

Valued by the natives as a specific against nausea, the part used is the stem after stripping off the leaves and peeling (Bot. Mag. l.c.); the outer part of the stem, cut into strips and used to make baskets, Lower Dahomey, where the plant is cultivated for the purpose (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 317).

An ornamental plant 5–8 ft. high. The Botanical Magazine describes the method of propagation as peculiar and states that "it has no seed nor does it propagate from suckers, but the flower head after shooting out its flowers and by its weight bending the long stem to the ground gradually withers while a new plant arises from its base."

Costus lucanusianus, *J. Braun & Schumann*: Fl. Trop. Afr. VII. p. 299.

Ill.—Gartenfl. xli. 1892, t. 1379; Schlechter, Westafr. Kautsch. Exp. p. 65.

Vernac. name.—Bosanga (W. Africa, *Mountmorres, Thompson*).

Oban in S. Nigeria (Talbot, Hert. Kew) and also known from the Cameroons and Lower Congo.

An infusion of the plant sometimes used by the natives to coagulate the latex of *Landolphia owariensis* (see p. 430 of this work and Col. Rep. Misc. No. 51, 1908, p. 37).

Leafy stems 6–7 ft. long similar in general appearance to the foregoing.

The root of an allied species (*Costus speciosus*, Sm.) of India has been examined as a food-stuff (see Hooper, Agric. Ledger, No. 2, 1906, pp. 19–21, with analysis).

Hedychium, Koenig.

Hedychium coronarium, *Koenig* in Retz. Obs. iii. (1779–91) p. 73.

Rootstock, perennial, tuberous, developing horizontally near the surface of the ground. Stems leafy 3–6 ft. high about $\frac{3}{4}$–$1\frac{1}{2}$ in. thick. Leaves oblong or lanceolate distichous with long sheaths clasping the stem. Inflorescence a terminal spike; flowers white.

Ill.—Rumpf, Amb. v. f. 69, t. 3; Jacq. Fragm. Bot. tt. 130, 136, f. 1; Bot. Mag. t. 708; Smith, Exotic Bot. t. 107; Redouté, Choix Fl. viii. t. 436; Lodd. Bot. Cab. t. 507; Roscoe, *Scitamineae*, t. 51 [29]; Wight, Ic. Pl. Ind. Or. vi. t. 2010; Martius, Fl. Bras. iii. pt. 3, t. 10, f. 1 (var. *maximum*); Kew Bull. 1912, p. 375; 1914, p. 368, f. 1; Journ. Roy. Soc. Arts. lxi. 1913, p. 352, f. 1, p. 354, f. 2 (in Brazil), p. 355, f. 3 (at Kew).

Vernac. names.—Lagrimo de Moca, Escaldameo (Brazil, *Martius, Schumann*); Wild Jasmine (Brazil, *Clayton Beadle & Stevens*); Sweet-scented Garland Flower (Smith, l.c. & Bot. Mag. l.c.); Ginger Lily.

Native of India. Grown in Ceylon, Malaya, Brazil, Central America, West Indies, British Guiana, Mauritius and West Africa.

Recommended as a paper-making material, for which purpose it was fully discussed in Kew Bull. 1912, pp. 373–378. It is not advisable to ship the stems as cut; it has been found that "if the juices were not expressed from the fibre before it was dried for shipment it pulverised owing to fermentative changes and became useless" (Clayton Beadle & Stevens, Journ. Soc. Chem. Industry, March 31st, 1913). An alternative method usually recommended for shipping paper materials is as "half stuff." Samples of paper (from Messrs. Clayton Beadle & Stevens) in the Kew Museum were made from fibre which before shipment was passed through sugar crushing mills to express the juices, and then dried.

"Hedychium Oil" is distilled from the flowers (Parry, Chem. Ess. Oils & Art. Perf. p. 202), said to have a pleasant, delicate but faint odour (Gildemeister & Hoffmann, Vol. Oils, p. 312), and this plant amongst others is reported to be under experimental study at Orlando, Florida, for the production of volatile oil (Perf. & Ess. Oil Rec. April, 1918, p. 100).

The plant has been grown in Old Calabar and recommended to be grown in West Africa for papermaking—although an attempt to grow it on the Gold Coast for this purpose is reported to have given negative results (Rep. Agric. Dept. Gold Coast for 1915, p. 13). It is easily propagated by division of the rhizomes, grows freely and produces heavy cuttings one or more times a year according to conditions, and well adapted to growing in swampy land. When once established comparatively little cultivation would be required.

Ref.—" New Sources of Paper (*Hedychium coronarium* and allies)," Kew Bull. 1912, pp. 373–378.——" *Hedychium coronarium* from Calcutta," l.c. 1914, pp. 165–167; in B. Guiana, l.c. p. 175.——" *Hedychium coronarium* and allied species," l.c pp. 368–372.——" *Hedychium coronarium* in Brazil," l.c. 1917 pp. 104–105.——" *Hedychium coronarium*," Beadle & Stevens in Journ. Roy. Soc. Arts, lxi. Feb. 14th, 1913, pp. 352–360.

CURCUMA, Linn.

Curcuma longa, *Linn.* Sp. Pl. (1753), p. 2.

A perennial with rhizomes, sometimes rounded, sometimes elongated, or both forms on the same plant. Leaves, somewhat chartaceous, lanceolate acuminate, several apparently forming part of one stem near the base, dividing about midway into an open top. Inflorescence a short spike made up of closely formed pale green bracts, each containing two white or yellowish-white flowers.

Ill.—Rheede, Hort. Mal. xi. t. 11; Plant. Indig. et Exot. Ic. t. 79; Jacq. Hort. Bot. Vindob. iii. t. 4 (*Amomum Curcuma*); Redouté, Choix Fl. viii. t. 473; Bot. Reg. (1825) t. 886; Wagner, Pharm. Med. Bot. tt. 131, 132; Woodville, Med. Bot. iv. t. 252; Guimpl. Abbild. Beschr. iii. t. 258; Bentl. & Trimen, Med. Pl. t. 269; Köhler, Med. Pflan. i; Duthie, Field Crops, t. 77; Bull. Econ. Indo.-Chine, 1905, p. 1151; Ridley, Spices, p. 423.

Vernac. names.—Gangaman (Hausa, *Dalziel*); Gangamu or Gangammo (N. Nigeria, *Dudgeon*); Haldi (N. Prov. India, *Srivastava*); Ago or Ega (Tonga Islands, *Crosby*); Turmeric, Long Rooted Turmeric (*Woodville*).

Cultivated in India, Ceylon, Malaya, China, East Indies, Islands in the Pacific including Fiji, etc. in Queensland and other warm countries. The plant was being grown at Old Calabar in 1898—the writer's report for 1898–99 shows 12 lb. Turmeric distributed during the year. Specimens in the Herbarium and Museum at Kew (Dalziel, No. 828, 1913—Abinsi & Vicinity; Imp. Institute, No. 30472–3, 1909) from Nigeria and other parts of West Africa—although not altogether satisfactory, go to show that it is in all probability the same plant.

The leaves are used as a condiment, especially with fish, which are wrapped up in them and then fried, India (Watt, Comm. Prod. India, p. 448).

The dried rhizomes are a well-known condiment, largely used in the preparation of curry powder, as a colouring matter in confectionery and to some extent for the same purpose in medicine. Used also as a dye in Europe, India (Dict. Econ. Prod. India), West Africa, Congo region, etc., in Tropical Africa, a yellow tincture obtained from the rhizomes being used to colour hides in the Nigerian Soudan, Ivory Coast, Dahomey, and the Congo, where the plant is cultivated for the purpose(Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 317) and in the process of tanning in Northern Nigeria, "a pale yellow is imparted to the skin by an infusion made from the root of a kind of turmeric which is pounded up for the purpose" (Dudgeon, Agric. & For. Prod. W. Afr. p. 138). "Gangammo" root in the dyeing of yellow leather "is merely powdered up, mixed with water and the mixture rubbed into the skin, which is then finished off as for red leather" (Bull. Imp. Inst. 1908, p. 179). The rhizome is sold in the form of slices for use as a yellow dye for leather, N. Nigeria (Dalziel, Hausa Bot. Voc. p. 33). The process of dyeing cloth (chiefly cotton and to some extent for silk) in China appears to be equally simple—"one catty [$1\frac{1}{3}$ lb.] of the powder is boiled in a pot of water and the cloth having been damped with cold water is placed in the pot and boiled for an hour, removed, washed in clean water and dried in the sun" (Hosie, Rep. Ssŭchuan, China, No. 5, 1904, p. 44); for this purpose however, the yellow colouring matter—curcumin—"possesses the serious drawback of being changed into red by soap or by alkalis; the best shade is obtained on wool previously mordanted with bichrome and oxalic acid (Srivastava, Agric. Journ. India, Special Congress No., 1916, p. 56). In India a form with a harder rhizome than the aromatic one used as a spice is used for dyeing (Ridley, Spices, p. 436).

Both round and long forms come into commerce, and the prices in 1909—quoted for this year because of the mention of a consignment from Africa—for "Bombay bulbs," 14*s.*–14*s.* 6*d.* per cwt., when for "a package of medium to bold flat 'African Finger' of good colour, shipped from Chinde, no bid was made" (Chem. & Druggist, May 22nd, 1909, p. 809). In 1920, in London, "Madras finger" sold at 47*s.* 6*d.*–50*s.* and Cochin at 50*s.*–52*s.* 6*d.* per cwt. (l.c. March 27th, 1920).

For cultivation [and yield-approx. the same] see under *Zingiber officinale.*

Ref.—"On the Commercial Varieties of Turmeric," Pereira, in Pharm. Journ [1] 1850, pp. 309–313, with illustrations of "China," "Bengal," "Madras," "Malabar" and "Java" Turmeric.——"On African Turmeric," Daniell, in Pharm. Journ. [2] i. 1859, pp. 258–260.——"Turmeric," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 659–669.——"*Curcuma longa,*" in Comm. Prod. India, Watt, pp. 445–449 (John Murray, London, 1908).——"The Cultivation of Turmeric on the Foot-hills of Toungoo, Burma," Sawyer, in Agric. Journ. India, iv. 1909,

pp. 87–89.——"Turmeric," in Spices, Ridley, pp. 422–444 (Macmillan & Co., Ltd., London, 1912).

AMOMUM, Linn.

Amomum angustifolium, *Sonnerat*; Fl. Trop. Afr. VII. p. 308.

Ill.—Lam. Encyl. t. 2, f. 1 (*A. madagascariense*), Hooker, Kew Journ. Bot. iv. (1852) t. 5 (*A. Afzelii*), vi. (1854), p. 294 (*A. Daniellii*); Bot. Mag. t. 4764 (*A. Daniellii*), t. 5250 (*A. Clusii*).

Vernac. names.—Barsalo (Sierra Leone, *Daniell*); Bassalo (Gold Coast, Slave Coast, Fernando Po. Bot. Mag. t. 4764); Longouze (Madagascar, *Hanbury*).—Bastard Meligetta (*Pereira, seq.*, Fernando Po, *Daniell*, Herb. Kew).

Found in West Africa, Fernando Po, Gaboon, Angola, E. Africa, Mauritius and Madagascar.

There appears to be no record from Nigeria; but "Cameroon Cardamoms" (so-called) are believed to be obtained from this species, said to yield an oil having a cinerole content suggestive of "Cajaput" oil and so far as aroma is concerned not comparable with "Ceylon Cardamom" oil (Schimmel & Co. Semi-Ann. Rep. April 1912, pp. 136–137—*Aframomum angustifolium*; *A. Daniellii*).

Plant 5–6 ft. high (Johnson, Herb. Kew); propagated by seeds or division of the roots.

Ref.—"The Madagascar Cardamom or Longouze," Hanbury, in The Pharm. Journ. [3] ii. 1872, p. 642.——"*Amomum angustifolium*," Kew Bull. 1898, p. 288.——"Cameroon Cardamoms," in Semi-Annual Report, Schimmel & Co., April, 1912, pp. 136–137.

Amomum Granum-Paradisi, *Linn.*; Fl. Trop. Afr. VII. p. 304.

Ill.—Rheede, Hort. Mal. xi. t. 6; Plenck, Ic. t. 112; Smith, Exotic Bot. t. 111 (*A. grandiflorum*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 65; Bot. Mag. t. 4603; Lemaire, Le Jard. Fl. ii. 1852, t. 178.

Vernac. names.—Oburo (Lagos, *Millen*); Oburo (Yoruba, *Millson*); Grains of Paradise, Alligator Pepper (Punch, No. 80, 1900, Herb. Kew).

Lagos, Yoruba, Nupe, Aboh, Nun (Niger) river and Onitsha in Nigeria and widely distributed in West Africa.

Fruit edible, Lagos (Millen, Herb. Kew).

The seeds together with those of *A. Melegueta* (*q.v.*) at one time came into commerce largely as a spice, although latterly of less importance than when the "Grain Coast" in West Africa, during the middle ages—14th to 15th cent. (see Johnston, Liberia i. pp. 56, 57)—took its name from them as the most important source. At the present time they are chiefly used in veterinary medicine (Greenish, Mat. Med. (1909) p. 215). "Oburo" is said to be a medicine for throat in Yoruba (Kew Bull. 1891, p. 209).

A sample of the whole pods from S. Nigeria and a sample of "guinea grains" from the Gold Coast, examined at the Imperial Institute, were found to be in good condition, but it was stated that the demand at the time (1912) for seeds was limited (Col. Rep. Ann. No. 778, 1913, p. 38).

The seeds of this species and of *A. Melegueta* are indistinguishable, both being aromatic, brown and about $\frac{1}{6}$ or $\frac{1}{10}$ in. diameter; but the fruit in this species is sulcate, in the other not sulcate.

Plant 4–5 ft. high; may be propagated from seeds or division of the roots; but rarely cultivated.

Ref.—See under *A. Melegueta*.

Amomum latifolium, *Afzel.*; Fl. Trop. Afr. VII. p. 305.

Vernac. name.—Mabooboo (Sierra Leone, *Daniell*, *Hill*).

Niger Delta, Grand Bassa, Sierra Leone, Nyanza.

Pith surrounding the seed chewed before the seed is ripe, the juice said to possess sustaining qualities, Kavirondo, Nyanza (Ainsworth, Herb. Kew).

Leafy stems 4–5 ft. long.

Amomum Melegueta, *Rosc.*; Fl. Trop. Afr. VII. p. 303.

Ill.—Roscoe, *Scitamineae*, t. 98; Pereira, Mat. Med. ii. pp. 1131, ff. 235–239; Bentl. & Trimen, Med. Pl. t. 268; Bot. Mag. t. 5987 (var. *minor*); Johnston, Liberia, i. p. 58 (*Aframomum Melegueta*).

Vernac. names.—Chitta (Hausa, *Dalziel*); Attahre (Yoruba, *Daniell*); Alligator Pepper (Sierra Leone, *Dudgeon*); Melegueta Pepper and also Grains of Paradise.

Yoruba, Ikure, in S. Nigeria; Sierra Leone, Gold Coast, Fernando Po, and probably most parts of West Africa.

Seeds imported as a spice—see under *A. Granum-Paradisi*—in bags of about 1¼ cwt. Liverpool (Hillier, Kew Bull. 1913, p. 85).

Leafy stems 4–5 ft. seen 3 ft. flowers pink, Ikure (Holland, Herb. Kew). Wild in certain parts of the forests of the Ivory Coast and Liberia and cultivated for the "Meleguette" ou "Graine de Paradis" in French Guinea, Ivory Coast, Sierra Leone and Lower Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 317 — *Aframomum Melegueta*). May be propagated by seeds or rhizomes.

Ref.—"On the fruit of *Amomum Melegueta*," Pereira, in Pharm. Journ. vi. 1847, pp. 412–419.——"*Amomum Granum-paradisi*, Grain of Paradise or Mellegetta Pepper," Pharm. Journ. xii. 1852, pp. 192–194.——"On the Amoma of Western Africa," Daniell, in Pharm. Journ. xiv. 1855, pp. 312–318, pp. 356–363; xvi. 1857, pp. 465–472, pp. 511–517.——"Grains of Paradise or Melegueta," in Spices, Ridley, pp. 320–323 (Macmillan & Co. Ltd. London, 1912).

ELETTARIA, Maton.

Elettaria Cardamomum, *Maton*, in Trans. Linn. Soc. x. (1808) p. 254.

Perennial rootstock with leafy stems, upwards of 9 ft. high. Leaves sheathing, the blade lanceolate-acuminate, glabrous or nearly so above and below, dark-green, 1–3 ft. long, 3–6 in. wide. Inflorescence a raceme on slender stems 2–3 ft. long, arising from the rootstock. Flowers 2 or 3 in each raceme, corolla lobes pale green, lip white, with dark lines. Fruit globose or ovoid; seeds 5–7, aromatic.

Ill.—Plenck, Ic. t.3 (*Amomum Cardamomum*); Roxb. Pl. Corom. t. 226 (*Alpinia Cardamomum*); Trans. Linn. Soc. x. (1808) tt. 4, 5; Woodville, Med. Bot. iv. t. 251 (*Amomum repens*); Berg & Schmidt, Darst. Beschr. Pharm. iv. t. 34c; Bentl. & Trimen, Med. Pl. t. 267; Köhler, Med. Pflan.; Zippel, Ausl. Handels Nährpfl. t. 10; Journ. Roy. Hort. Soc. xxxv. (1909–10) p. 380.

Vernac. names.—Ensal, Enasal (Ceylon, *Ridley*) Kapulaga (Malay, *Ridley*); Elettari (India, *Watt*).—Cardamoms, The Lesser Cardamom, The Malabar Cardamom.

Fruits imported as a spice for use in medicine and perfumery. The United Kingdom usually takes first place in the receiving countries of the exports from India—shipped from Bombay and Madras from whence an average of more than 100,000 lb. come annually (see Watt. Comm. Prod. Ind. p. 517) and large quantities are imported from Ceylon—168,216 lb. in 1913 (Perf. & Ess. Oil Rec. June 9th, 1914, p. 192); they are known in the trade according to their size as "shorts," "short longs" or according to locality from whence derived as Malabar, Madras and Ceylon,—those from Ceylon are usually considered the best. The Malabar Cardamom is the source of the seeds official in the British and other Pharmacopoeias; but the Cardamom oil of commerce is distilled almost exclusively from the long cardamom growing wild and cultivated in Ceylon (Perf. & Ess. Oil Rec. l.c. p. 201).

The cultivation is of importance in India and Ceylon. A tropical climate, good rainfall (upwards of 100 in.), light soil rich in humus or rich loamy soil in moist situations, such as edges of streams or low-lying ground—well-drained—and light shade are essential conditions. Those suitable for "Betel Palm" (*Areca Catechu*) and "Pepper" (*Piper nigrum*) are recommended. May be propagated by seeds or rhizomes raised in nursery beds; the seed may take 1–3 months to germinate and planted out when large enough to handle, 4–6 in. high or stronger plants that have been kept growing by transplanting in the nursery until upwards of 4 ft. high or about 12–18 months old. Watt recommends for permanent places 6–12 ft. apart, planted at the top of well-prepared holes. A full crop is obtained in about 5 years, the plants meantime yielding a little after about 2 years; the fruits take from 5–6 months from the time of flowering to ripen, and picking may go on more or less for the greater part

of the year. The fruits are dried in the sun on mats or trays or in special curing houses and the dried ends—calyces—are clipped off by hand or by machinery. The appearance of the fruit is sometimes improved by bleaching in strong sunlight or treating with starch or sulphur vapour, when they are ready for packing. (See Watt, Owen, Ridley, *seq.*)

Ref.—" A Botanical Description and Natural History of the Malabar Cardamom," White, in Trans. Linn. Soc. x. (1808) pp. 229–255.——" Fructus Cardamomi," in Pharmacographia, Flückiger & Hanbury, pp. 643–651 (Macmillan & Co. London, 1879).——Notes on Cardamom Cultivation, Owen (Ferguson, Colombo, 1883).——" *Elettaria Cardamomum* " in Dict. Econ. Prod. India, Watt. iii. 1890, pp. 227–236.——" Cardamom Cultivation in the Bombay Presidency," Mollison, Agric. Ledger, No. 11, 1900, pp. 107–113.——" *Elettaria Cardamomum* " in The Comm. Prod. of India, Watt, pp. 511–517 (John Murray, London, 1908).——" Cardamom Oil," in The Chemistry of Essential Oils, Parry, pp. 196–200 (Scott, Greenwood & Son, London, 1908).——" Cardamoms," in Materia Medica, Greenish, pp. 164–167 (J. & A. Churchill, London, 1909).——" Cardamoms " in Spices, Ridley, pp. 324–359 (Macmillan & Co., Ltd., London, 1912).

DONAX, Lour.

Donax cuspidata, *Schumann*; Fl. Trop. Afr. VII. p. 315.

Ill.—Roscoe, *Scitamineae*, t. 31 (*Maranta cuspidata*).

Vernac. names.—Afifiogili, Onwa (S. Nigeria, *Thomas*); Finibi, Fitta (Hausa, *Yates*).

Cross River, Abeokuta and Lokoja, in Nigeria, and also found in the Gold Coast, Sierra Leone, Uganda, etc.

Leaves very much sought after for wrapping " Kola Nuts " in, N. Nigeria (Yates, No. 39 Herb. Kew); [the leaves of *Donax filipes*, Schumann, (Hausa name " Fita ") are also stated to be commonly used to wrap up food (Dalziel, Hausa Bot. Voc. p. 31)]. Used for making fishing-nets, Gold Coast (Dudgeon, No. 6, Herb. Kew); stems used for binding in walls of wooden huts, Coomassie (Cummins, Herb. Kew).

Growing in jungle by streams, flowers March to April, Lapai, N. Nigeria (Yates l.c.); plant 3 ft. high, Lokoja (Shaw, Herb. Kew), 8–10 ft. Abeokuta (Barter, Herb. Kew), 12 ft. high, stems 1 in. diam., Aburi swamps (Johnson, No. 757, 1900, Herb Kew), 6–8 ft. high, Entebbe forests (Mahon, Herb. Kew) and found as undergrowth in forests, Toro, Uganda (Dawe, Bot. Miss., Uganda, 1906, p. 58).

ZINGIBER, Adans.

Zingiber officinale, *Rosc.* in Trans. Linn. Soc. viii. (1807) p. 348.

Rootstock a fleshy rhizome, with leafy stems about 2 ft. high. Leaves lanceolate-acuminate, light green, about 6 in. long and $\frac{3}{4}$ in. wide in the middle. Inflorescence on stem about

6–12 in. high, arising from the rhizome; flowers yellowish-white. Fruit—rarely seen—a capsule containing a number of small black, angular seeds.

Ill.—Rheede, Hort. Mal. xi. t. 12; Jacq. Hort. Bot. Vindob. i. t. 75 (*Amomum Zingiber*); Roscoe, *Scitamineae*, t. 83; Wagner, Pharm. Medic. Bot. tt. 119, 120; Nees von Esenbeck, Plant. Medic. Düsseld. t. 61 (*Amomum Zingiber*); Woodville, Med. Bot. iv. t. 250 (*Amomum Zingiber*); Guimpel, Abbild. Beschr. iii. t. 257; Stephenson & Churchill, Med. Bot. ii. t. 96; Burnett, Pl. Util. i. t. 3b; Van Hall, *Zingiberaceae*, tt. 1, 2; Berg & Schmidt, Darst. & Beschr. Pharm. iv. t. 34b; Bentl. & Trimen, Med. Pl. t. 270; Duthie, Field Crops, t. 100; Zippel, Ausl. Handels Nährpfl. t. 11; Köhler, Med. Pflan. ii; Agric. Gaz. N.S. Wales, ii. 1891, t. 50; Queensland Agric. Journ. vi. 1900, p. 498, tt. 201–203 (var. *Cholmondeleyi*); Greenish, Materia Med. p. 435 (rhizomes—Jamaica, African, Cochin); Karst. & Schenck, Veg. bild. viii. t. 46 (habit); Agric. Journ. India, vi. 1911, Frontispiece (Healthy and Diseased plants).

Vernac. name.—Chitta Afu (Hausa, *Dalziel*).—Ginger.

Cultivated in Tropical Asia, East and West Indies, West Africa, etc.

A well-known spice, a preserve and largely used by mineral water manufacturers. The commercial forms are known by their country of origin, as "Jamaica," "Sierra Leone," "Japanese," etc. and further as "coated," "scraped," "bleached" or "unbleached." Preserved ginger is the tender growing parts of the rhizome peeled and preserved in syrup, and "Chinese Green Ginger" is specially grown for this purpose, cultivated in the Delta of the Canton river. Although cultivated in many parts of West Africa, including Northern Nigeria, Sierra Leone, French Guinea, French Sudan and Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 317) it is only from Sierra Leone that the product appears to be a regular export, from whence in 1914, 1213 tons value £15,639 and in 1915, 567 tons value £8,091 were shipped. In 1915 the average price was 24*s*. per cwt. (Col. Rep. Ann. No. 888, 1916, p. 9). In 1896 the botanical Department at Victoria in the Cameroons shipped 270 kilos value £5 (Kew Bull. 1896, p. 177). It is reported as being extensively propagated in Nyasaland Protectorate 1908, where there were 2000 strong plants derived from 2 small plants received from Kew in 1901 (Chem. & Druggist, Oct. 10th, 1908, p. 583) and in 1914 a sample from Natal was considered of good quality and valued at about £20 per ton (Col. Rep. Ann. No. 882, 1916, p. 20).

The plant is propagated by pieces of the growing or budding ends of the rhizomes, planted in well-drained rich light soil 2–3 in. below the surface, about a foot apart, the field for the best crops being planted annually. When pieces are left in at the time of gathering—"ratoon ginger"—the crop deteriorates. The ground is occupied for nearly the whole year, harvesting by

forking up the rhizomes taking up more or less the last three months; it should be regulated so as to get the benefit of the rains during the growing season, except where it is possible to irrigate. At Old Calabar, planted May 11th, 1898, the rhizomes were dug up February 9th, 1899. Care is necessary when harvesting not to injure the ginger, and after the soil and fibrous roots are removed, the product is washed, scraped and dried—this taking a week or more. It is sometimes left unpeeled, or when peeled it is bleached by treating with chloride of lime or whitewashed with lime and water. In Malabar the process of bleaching consists in soaking, washing in lime water and then fumigating with sulphur vapour (Patwardhan, Agric. Journ. India, v. July 1910, p. 245). The average yield per acre is given as 8000–10,000 lb. (l.c. p. 246).

Ref.—" On the Commercial Varieties of Ginger," Pereira, in Pharm. Journ. ix. 1850, pp. 212–214, pp. 261–265, with figures of Jamaica & Barbados Ginger roots; pp. 261–265 with figures of " Coated Malabar," " Cochin," " Coated Bengal," " Bengal scraped " and " African " (Sierra Leone) Ginger.——" The Cultivation of the Ginger Plant," Turner, in Agric. Gaz. N.S. Wales, ii. Sept. 1891, pp. 507–510.——" Chinese Ginger," Kew Bull. 1891, pp. 5–9; 1892, pp. 16–20.——" Fiji Ginger," l.c. 1892, pp. 77–81.——" *Zingiber officinale*," in Dict. Econ. Prod. India, Watt, vi. part 4, 1893, pp. 358–366.——" Cultivation of Jamaica Ginger," in Pharm. Journ. [4] xix. Nov. 26th, 1904, p. 774; from Journ. d'Agric. Trop. iv. (1904).——" Culture et Préparation du Gingembre," d'après Cook & Collins, pp. 179–181 and Econ. Pl. Porto Rico (Contr. U.S. Nat. Herb. viii. part. 2, 1903, pp. 268–269.——" Ginger " in Bull. Imp. Inst. ii. 1904, p. 86; samples from B. C. Africa.——" Memorandum on the Prospects of Ginger Production : with special reference to Sierra Leone," Dunstan in The Sierra Leone Royal Gazette. April 6th, 1907, pp. 170–172.——" *Zingiber officinale*," in Comm. Prod. India, Watt, pp. 1139–1143 (John Murray, London, 1908).——" Ginger," Harris in Bull. Dept. Agric. Jamaica, i. No. 2, 1909, pp. 141–142; reprint in Pharm. Journ. [4] xxix. Sept. 18th, 1909, p. 379.——" Ginger," in Materia Medica, Greenish, pp. 432–436 (J. & A. Churchill, London, 1909).——" Bleaching of Ginger," Patwardhan, in Agric. Journ. India, v. July, 1910, pp. 245–248.——" Cultivation and Preparation of Ginger," *Zimmermann*, in The Tropical Agriculturist. xxxvi. April 15th, 1911, pp. 312–313.——" The Cultivation and Preparation of Ginger," Bull. Imp. Inst. x. 1912, pp. 112–120.——" Ginger," in Spices, Ridley. pp. 389–421 (Macmillan & Co. Ltd. London, 1912).

THAUMATOCOCCUS, Benth.

Thaumatococcus Danielli, *Benth.*; Fl. Trop. Afr. VII. p. 321.

Ill.—Pharm. Journ. xiv. 1855, p. 161 (*Phrynium Daniellii*); Horanimow, Prodr. Scit. t. 3 (*Monostiche Danielli*).

Vernac. names.—Ninkon (Old Calabar, Imp. Inst. No. 1, 1906, Herb. Kew); Kete-nfe (S. Nigeria, *Johnson*); Miraculous Berry (Yoruba, *Barter*); Katemfe (Soudan, *Daniell*). Akoos, Katemfe (Yoruba, *Hillier*).—Miraculous fruit of the Soudan.

Onitsha and other parts of S. Nigeria; Cameroons, Sierra Leone.

"Seeds covered with mucilage remarkable for a sweet liquorice taste rendering the palate incapable of distinguishing other flavours for some time," Onitsha (Barter, Herb. Kew); "seeds sucked by natives" (Imp. Inst. l.c.). "We have been told that monkeys eat this fruit with great avidity and we are also informed that the taste of sweetness remains in the mouth of persons who have tasted it for some twenty-four hours" (Letter, Messrs. Abram Lyle & Sons, Ltd. London, to Director, Kew, Feb. 10th, 1912).

The properties are said to be somewhat similar to those of *Sideroxylon dulcificum*, A. DC. (Kew Bull. 1906, p. 171 and the present work, p. 402).

A plant about 5 ft. high in deep vegetable soil, Onitsha (Barter, l.c.); the bright crimson fruits are developed just above the surface of the soil.

Ref.—"Katemfe or the Miraculous Fruit of the Soudan," Daniell, in Pharm. Journ. xiv. 1855, pp. 158–159.——Ninkon and Mfrinkon "Fruits and 'Inkon' leaves from S. Nigeria" Col. Rep. Misc. No. 71, 1910, pp. 232–233.

PHRYNIUM, Willd.

Phrynium Benthami, *Baker* [*Sarcophrynium macrostachyum*, K. Sch.]; Fl. Trop. Afr. VII. p. 323.

Vernac. names.—Gbodogi (Lagos, *MacGregor*, *Dawodu*); Mfrinkon (S. Nigeria, Imp. Inst. No. 2, 1906, Herb. Kew).

Lagos.

"Seeds surrounded by a similar jelly, but not eaten or sucked like those of "Ninkon" (*Thaumatococcus Daniellii*), the so-called "male" (Imp. Inst. No. 2, 1906, Herb. Kew). Plant "used in roofing houses," Lagos (MacGregor & Dawodu, Herb. Kew).

Phrynium ramosissimum, *Benth.*; Fl. Trop. Afr. VII. p. 326.

Nupe (Barter No. 1542, Herb. Kew) and also known from Fernando Po and Angola.

Leaves used to wrap Kola Nuts (*Cola acuminata*) in to keep them moist during their transit to the interior (Barter, l.c.) and to roll up cakes called "quiqangas"—"made of boiling meal obtained by pounding dried 'Mandiocca' (*Manihot utilissima*) roots previously steeped in water for several days," Angola (Monteiro, June 1873, Herb. Kew.).

A mat made of the split stems of a species of *Phrynium* is in the Museum at Kew, from Ikpa, Cross River (Holland, 1899) which may belong here or to the above species.

A trailing plant growing upright at first to a height of about 6 ft., in wet and shady places, Angola (Monteiro, l.c.); growing 5 ft. in swampy ravines, Nupe (Barter, l.c.).

MARANTA, Plum.

Maranta arundinacea, *Linn.* Sp. Pl. (1753), p. 2.

A herbaceous perennial, 2–3 ft. high, rootstock creeping, developing fleshy rhizomes or tuberous roots from which the starch is obtained and the plant propagated. Leaves with long hairy sheaths more or less enveloping the stem, entire, glabrous on both surfaces or slightly hairy underneath, pale green. Inflorescence a terminal lax panicle, small, calyx green, corolla white. Fruit small, round; never relied upon to produce seed under cultivation.

Ill.—Redouté, Choix Fl. i. t. 57; Tussac, Fl. Ant. i. t. 26 (*M. indica*); Bot. Mag. t. 2307; Hayne, Darst. Beschr. Gewächse. ix. t. 25 t. 26 (*M. indica*); Roscoe, *Scitamineae*, t. 25; Guimpel, Abbild. Beschr. t. 106; Nees von Esenbeck, Plant. Medic. Düsseld. tt. 69, 70; Wallich, Pl. Asiat, Rar. iii. t. 286 (*M. ramosissima*); Gard. Chron. June 27th, 1846, p. 428, f. 4; Bentl. & Trimen, Med. Pl. t. 265; Zippel, Ausl. Handels, Nährpfl. t. 52; Safford, Useful Pl. Guam; Contr. U.S. Nat. Herb. ix. 1905, t. 25 (rhizome, leaf & fl.); Karst. & Schenck, Veg. bild. viii. t. 44 (growing plant).

Arrowroot, Indian Arrowroot, St. Vincent Arrowroot, Bermuda Arrowroot, West Indian Arrowroot.

A native of Tropical America and the West Indies; cultivated in India and Tropical Africa.

The starch or flour obtained from the rhizomes—containing about 27 per cent. (*see* Kew Bull. 1893, p. 197) is an important and well-known food product. The important commercial sources are Bermuda, St. Vincent and India; that from the West Indies amounting in 1914 to 36,870 cwt., value £59,631, and in 1918, 37,351 cwt., value £250,285 (Trade of the United Kingdom, i. 1919, p. 101).

The plant is a perennial, grows about 2 ft. high and comes to maturity in from 9–10 months—sometimes a year; planted in January (1898) the crop was ready for digging in November at Old Calabar. Selected rhizomes are planted in rows about 2 ft. apart; 1–1½ ft. apart in the rows and 3–4 in. below the surface, they are earthed up like potatoes and the crop is ready to harvest when the leaves begin to die down. Rich light, well-drained soil is essential, also a good rainfall (or thorough irrigation) during growth. A good supply of water is also indispensable in the preparation of the starch, which is extracted as soon as possible after the roots are dug up. The rhizomes are washed and scraped, then grated and the fibrous matter taken out by repeated washing in water, this usually rising to the surface and lifted or poured off with the water after the starch has settled.

The starch when sufficiently clean and pure is then dried on clean paper or other clean surface by exposure to air and sun, and packed in bags, barrels or boxes for market. A good yield is given at from 13,000–15,000 lb. of roots yielding an average of 22 cwt. of air-dried starch per acre (see Kew Bull. 1893, for full particulars of planting, manufacture and yield, pp. 194–198).

Ref.—" Amylum Marantae," in Pharmacographia, Flückiger & Hanbury, pp. 629–633 (Macmillan & Co. London, 1879).——" The Preparation of Arrowroot in Bermuda," Journ. Soc. Arts. xxxv. 1887, pp. 801–802.——Arrowroot, *Maranta arundinacea* in Trop. Agric. Nicholls, pp. 278–283 (Macmillan & Co. London, 1891).——" St. Vincent Arrowroot," Kew Bull., 1893, pp. 191–204.——" Bermuda Arrowroot," Kew Bull., 1898, pp. 50–51. ——" *Maranta arundinacea*," in Dict. Econ. Prod. India, Watt. v. 1891, pp. 180–185.——" *Maranta arundinacea*," in Comm. Prod. India, Watt, pp. 773–774.——" Bermuda Arrowroot," Bull. Imp. Inst. x. 1912, pp. 566–569.

Calathea, G. F. Meyer.

Calathea conferta, *Benth.*; Fl. Trop. Afr. VII. p. 327. [*Phrynium confertum*, K. Schum. in Engl. Pfl. *Marant.* p. 56.]

Ill.—De Wildeman, Mission E. Laurent, t. 54 (*Phrynium confertum*).

Vernac. name.—Subi grande (Golungo Alto, *Ridley*).

Oban, S. Nigeria (Talbot, No. 884, Herb. Kew); Cameroon Mts.—3000 ft. (Mann, No. 2144, Herb. Kew); Kibbi—Akim Gold Coast (Johnson, No. 246, Herb. Kew) and in Angola.

Promiscuously mixed with *Clinogyne purpurea*, which like this plant is called " Subi " by the natives. " Subi " signifies a textile plant—this is the " Subi grande," Angola (Ridley, Journ. Bot. 1887, p. 133, *Phrynium textile*).

Found growing 4–5 ft. high in swamps, Gold Coast (Johnson l.c.). Cultivated at Kew (1914) and Brussels (1901) as a decorative plant (Synonym. *Maranta Lujaiana*), first noted in Revue Horticole, 1900, p. 853.

The tubers of " Topee Tambou " (of Dominica & Trinidad) or " Allouya " of the Carib people (*Calathea Allouya*, Lindl.) are used as food—boiled and eaten like the ordinary potato in Trinidad and Dominica (see Kew Bull. 1892, pp. 244–245).

Canna, Linn.

Canna indica, *Linn.;* Fl. Trop. Afr. VII. p. 328.

Ill.—Rheede, Hort. Mal. xi. t. 43; Gaertner, Fruct. Sem. Pl. i. t. 12; Buchoz, Herb. Col. Ameriq. t. 4; Lam. Encycl. t. 1; Bot. Reg. (1823) t. 776; Bot. Mag. t. 454; Redouté, Choix Fl. iv. t. 201; Desc. Ant. iv. t. 240; Roscoe, *Scitamineae*, tt. 1 (*C. indica*), 12 (*C. orientalis*); Nicholson, Dict. Gard. i. p. 261 (habit); Bertoloni, Misc. Bot. xx. t. 1 (*C. bidentata*); Gartenfl.

xxxviii. 1889, t. 1303 (vars. "Victor Hugo," "Guillaume Coustou").

Vernac. names.—Esalebo (Benin, *Unwin*); Ebesalebo (Benin, *Farquhar*); Okookoko, Nzonomo (Agolo, S. Nigeria, *Thomas*); Tasbi—"Rosary" (Nyika, *Wakefield*); Balisier a larges Feuilles (Antilles, *Descourtilz*); Balisier des Indes (*Redouté*); Indian Cane (*Descourtilz*—Common Indian Reed, Indian Shot.

Oban, Benin, Aboh–Lower Niger, and found also in Senegal, Sierra Leone, Ashanti, East Tropical Africa, Natal and Tropical Asia. Native of Tropical America.

Used medicinally, Antilles (*Descourtilz*, l.c.); and necklaces are made of the seeds in India and East Africa (Mus. Kew). The plant is very ornamental and there are some fine varieties cultivated in gardens. Propagated from seed or by division of the rootstocks: and plants grow freely in rich open well-drained soil.

Canna edulis, Ker. the "Tous les Mois" of the West Indies, also known as "Queensland Arrowroot," yields a starchlike Arrowroot from the tuberous roots. (See Kew Bull. 1893, pp. 331–333; Agric. News, Barbados, April 17th, 1909, p. 119.)

MUSA, Linn.

Musa Cavendishii, *Lambert*, Pax. Mag. Bot. iii. (1837) p. 51 [*M. chinensis*, Sweet, Hort. Brit. ed. 2, p. 596].

A herbaceous perennial, 4–6 ft. high. Leaves 6–8 in a spreading head, each 2–3 ft. long, 1 ft. or so broad, base rounded, glaucous green. Spike, 1–2 ft. long, bearing on an average 200–250 fruits, or found to bear from 12–14 hands, an average bunch containing about 400 fruits (Sprague & Hutchinson, Kew Bull. 1913, p. 290)—4–6 in. long, 1–1½ in. diam., 5–6 sided.

Ill.—Garden, 1893, p. 496; Kew Bull. 1894, p. 296; Add. Series vi. 1906, *Musa*, p. 68; Rep. Agric. & Bot. Dept. Barbados, 1908, f. 11 (plant in bearing); Philippine Journn. Sc. (Bot.) x. Nov. 1915, t. 16 (var. *hawaiiensis*).

Chinese Banana, Dwarf Banana, Canary Banana.

Native of S. China. Cultivated in the Canary Islands, Barbados, Mauritius, Seychelles, Fiji, Samoan or Navigator Islands, and in many other tropical and sub-tropical countries, including West Africa. In Nigeria, at Oloke Meji, 50 suckers obtained from the Canary Islands in October 1906 were reported to be doing well, and it was hoped that suckers would be available for sale in the following year (Col. Rep. Misc. No. 51, 1908, p. 43) and a plantation is recorded as having been formed there in 1908 (Kew Bull. 1908, p. 201). Bananas were also reported to be doing well at Kaduna, N. Nigeria (Rep. 1917, p. 20).

The principal commercial source of this banana is the Canary Islands, from whence in 1913, 2,138,000 bunches were received. It is packed with much greater care than the "Jamaica Banana"—a fruit less liable to injury in travelling—being usually packed separately with dry banana leaves in wooden crates, or in baskets

made from the split stems of the "Common Reed" or "Spanish Cane" (*Arundo Donax*, Linn.) or "the bunches are packed first of all in cotton wool, then in newspaper, afterwards in straw and finally wrapped in dry banana leaves, the whole being rammed tight before the crate is fastened up" (Kew Bull. 1913, p. 295; Add. Series vi. p. 69); carried in open holds or on the decks of the ships.

It is more suitable for cultivation in sub-tropical regions or the higher and cooler parts in the Tropics than *M. sapientum*, and comes to maturity in from 12–18 months. In the Canary Islands, the cultivation is carried on under irrigation—"each banana plant in the plantation is irrigated every ten days, alternate days being devoted entirely to this work. After bearing the stems are cut off about 2 ft. above the ground, and are fed to oxen, the dry leaves being used for packing. Only one sucker is left to replace the old stem, the stump of which remains in the ground for a year and is then uprooted, broken up and used as manure. The suckers take a year or more to come into bearing and the bunch of fruit is ready for cutting about 5 months after the first bracts open" (l.c. 1913, p. 295).

Musa sapientum, *Linn.*; Fl. Trop. Afr. VII. p. 330.

Ill.—Roxb. Pl. Corom. iii. t. 275; Dict. Sc. Nat. t. 66; Schacht, Madeira & Teneriffe, t. 2 & p. 36; Nooten, Fl. Java, t. 38; Spach, Suites (Hist. Nat. des Végétaux) t. 102; Teysmannia, Batavia, xix. 1908, p. 768 ("Pisang radja"); Philippine Journ. Sci. (Bot.) x. Nov. 1915, tt. 7–15 (varieties, fruits & flowers).

Vernac. name.—Ayaba (Hausa, *Dalziel*).—Banana.

var. **paradisiaca,** *Linn.*; Fl. Trop. Afr. VII. p. 331.

In general appearance same as the type plant; fruit larger and 3-sided instead of several-sided.

Ill.—Rheede, Hort. Mal. i. tt. 12–13; Rumpf. Amb. v. t. 60; Lam. Encycl. tt. 836, 837; Velloso, Fl. Alogr. Brazil, p. 227; Tussac. Ant. i. tt. 1 & 2; Dict. Sc. Nat. t. 67; Redouté, Choix Fl. viii. t. 443 (stem) t. 444 (fruit); Lodd. Bot. Cab. t. 684; Kew Bull. April 1887, p. 4; 1894, p. 232; Add. Series vi. 1906, Musa, p. 4; Philippine Journ. Sci. (l.c.) tt. 16, 17 (vars.).

Vernac. name.—Ayaba (Hausa, *Dalziel*).—Plantain.

The banana and the plantain are both cultivated throughout the Tropics—including Asia, Africa, America, West Indies, East Indies, Queensland and Philippine Islands; the former as a fruit and the latter as a vegetable. The plantain rarely comes into this country, but the banana is well known everywhere. The principal sources of supply are Costa Rica, Colombia, British West Indies, and as before stated (*M. Cavendishii*) the Canary Islands, to a total of more than 7,000,000 bunches annually. The variety chiefly grown in Jamaica and Costa Rica is "Gros Michel" (also grown in Trinidad, Martinique and Dominica—where it is known as "figue la rose")—18–20 ft. high, fruit

larger and coarser than that of the "Canary Banana." It is usually exported without individual packing, in ships specially fitted for the purpose with cold storage; each bunch is stood on the stout cut end as closely as possible without crushing in the holds, whence they are loaded and unloaded singly on revolving hoists, being conveyed to and from these by hand.

Both plants yield a fair quality fibre (Kew Bull. April 1887, pp. 5–8; 1894, pp. 289–293), but it is of little or no importance commercially in competition with that of "Manila Hemp" (*Musa textilis*). The stems have been used for paper-making in India (Kew Bull. April 1887, p. 7). Banana fibre for paper-making has been discussed by Clayton Beadle and Stevens (Chem. News & Journn. Phys. Sc. cxii. Nov. 12th, 1915, p. 235) and they conclude that fibre of this class would have to undergo some mechanical process of treatment on the field or at some convenient collecting centre very near to the gathering, in order that the chemical treatment could be effected in an economical manner. In their table "summarizing field trials on yield of fibre on green stem and approximate amount of green stem required to produce 1 ton of paper," they estimate (on figures in Kew Bull. Add. Ser. ii. Veg. Fibres, pp. 97, 98, 103) an average of 132·4 tons of green weight per ton of paper. The fibre has been suggested for making bags to carry raw sugar in the Hawaiian Islands, where some uncertainty has arisen in the supply of Calcutta Jute bags, for which, so far as the investigation has gone, the Banana fibre bags would make a good substitute (Agric. News, Barbados, Nov. 17th, 1917, p. 361, from Chamber of Commerce Journ. Oct. 1917). Cloth is made of the stem of "Tundoc" (*M. paradisiaca*, var. *magna*, Blanco) as from the "Abaca" (*M. textilis*)—but it is not so good—in the Philippines (Teodoro, Philippine Journ. Sc. l.c. p. 413).

The leaves—of an introduced African banana—before they are fully developed have been found by coopers in Madeira to be very superior to the rushes formerly imported from Lisbon for the heading of wine casks (Bowdich, Madeira, p. 119). The flowers of "Saba" (*M. sapientum* var. *compressa*, Blanco) are cooked as a vegetable in the Philippines (l.c. p. 415).

The fruit that is unfit for eating has been suggested as a source of alcohol, the yield having been estimated at 4½ litres from each bunch of bananas in Guatemala (Kew Bull. 1912, p. 115) and 100 kilograms of meal from peeled unripe bananas have been found to yield 47·8 litres of alcohol (Bull. Imp. Inst. 1912, p. 490; Journ. Soc. Chem. Ind. 1912, p. 453) and banana skins and stalks have been recommended as a source—as rich as Kainit—of potash (Pharm. Journ. [4] xliii. 1916, p. 7; Ellis, Journ. Soc. Chem. Ind. 1916, p. 521).

The cultivation is comparatively easy—briefly, propagation is by suckers or division of the root-stock, planted 6–15 ft. apart according to height and vigour of the species or variety; rich deep soil well-drained—and a good rainfall being essential.

The bunches are cut green for shipment. There are many cultivated varieties, full particulars of which are given in Kew Bull. (*seq.*) and other works to which reference is made, together with more detail as to cultivation, various economic uses and trade.

Ref.—" Plantain and Banana Fibre (*Musa sapientum*)," Kew Bull. April 1887, pp. 5–8; reprinted in Add. Series ii. " Veg. Fibres," pp. 97–105.——" Species and Principal Varieties of *Musa*," Kew Bull. 1894, pp. 229–314; reprinted as Add. Series vi. 1906, pp. 1–88.——" Mexican Banana," Dering, Diplomatic & Consular Rep. Misc. No. 385, 1895, pp. 27–31.——" The Banana Soils of Jamaica," Cousins, in Bull. Bot. Dept. Jamaica, viii. Oct. 1901, pp. 145–153, with analyses of the various soils.——" L'Importation des Ananas et des Bananas de la Guinée Française," Debreuil, in Revue Cult. Col. x. 1902, pp. 142–146 ——" Les Bananiers en Afrique occidentale," Chevalier, l.c. pp. 289–294.——" Farine de Banane," Leuscher, in Journ. d'Agric. Tropicale, iii. 1903, pp. 304–306.——" Leuscher's Method of Preparing Banana Flour," Neish, in Journ. Jamaica Agric. Soc. vii. No. 11, 1903, pp. 439–441.——The Banana in Hawaii, Higgins, U.S. Dept. Agric. Hawaii Agric. Exp. St., Bull. No. 7, 1904, pp. 1–53; pls. i.–ix. (Hawaiian Gazette Co. Ltd. Honolulu, 1904).——" The Cultivation of Bananas and Pine-Apples," Bull. Imp. Inst. iii. 1905, pp. 62–69.——" Banana Cultivation," Hale, in Agric. Bull. Fed. Malay States, v. June 1906, pp. 185–192, with particulars of 75 varieties.——" Dried Bananas," Bull. Imp. Inst. vi. 1908, pp. 113–115.——" Plantain Fibre " and " Banana Fibre," l.c. pp. 240, 241; Gold Coast.——" Banana Cultivation in Egypt," Kew Bull. 1908, pp. 102–105.——" Bananas in the West Indies," Henricksen, in " Tropical Life," November, pp. 170–171 and December 1908, pp. 186–187.——" Bananiers," De Wildeman, in Annales du Mus. Col. de Marseille, vii. 1909, pp. 238–247.——Le Bananier, Hubert, pp. 1–222, illustrated (H. Dunod & E. Pinat, Paris, 1910).——" Banana Products from the Seychelles," Col. Rep. Misc. No. 71, 1910, pp. 230–231.——" The Drying of Plantains at Ayashi," Kulkarni, in Agric. Journ. India, vi. 1911, pp. 289–291; pls. xxxix.–xl. " Rajeli," the special variety dried.——" Les Bananiers : Culture Exploitation, Commerce, Systématique de Genre *Musa*," De Wildeman, in Annales du Mus. Col. de Marseille, x. 1912, pp. 286–362.——" The World's Widest-Known Fruit," Barrett, in Philippine Agric. Review, v. 1912, pp. 375–384.——" Notes on the Banana," Fawcett, in the West India Committee Circular, xxvii. Jan. 2nd, 1912, pp. 4–6, concluded in No. 361, July 30th, 1912 appearing in each issue (fortnightly) except one (July 16th).——The Banana : Its Cultivation, Distribution and Commercial Uses, Fawcett, pp. 1–287 (Duckworth & Co., London, 1913).——" Varieties of Plantains and Bananas Cultivated in the Seychelles," Kew Bull. 1913, pp. 229–231.——" The Bureau of Agriculture Banana Collection," Barrett, in Philippine Agric. Review, vi. Sept. 1913, pp. 433–439, with an extensive list of varieties.——" A Preliminary Study of Philippine Bananas," Teodoro, in

Philippine Journ. Science x. Section C. Botany, Nov. 1915, pp. 379–421; vii–xviii.——"Banana Fibre for Paper-making: the Yield of Paper on Green Stem of Banana," Clayton Beadle & Stevens, in the Chemical News & Journ. Physical Science, cxii. Nov. 12th, 1915, p. 235.——"Banana and Plantain Fibres," in Cotton and Other Vegetable Fibres, Goulding, pp. 164–166 (John Murray, London, 1917).

Musa textilis, *Née*, in Anal. Cienc. Nat. Madrid. iv. (1801) p. 123.

A perennial plant; stem 20 ft. or more high, in general appearance same as the above species. Fruit trigonous and resembling more that of the "plantain," 2–3 in. long, about 1 in. diam.; containing black angular seeds about $\frac{1}{6}$ in. diam.; not edible.

Ill.—Kew Bull. 1894, p. 290; Add. Ser. ii. Veg. Fibres, p. 102; vi. *Musa*, p. 62; Oliver, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 46, 1903, t. 8 (Seedlings, 6 weeks old); Philippine Journ. Sci. (Bot.) x. Nov. 1915, t. 18, ff. 6–10; India Rubber World, Feb. 1st, 1918, p. 262 (Plantation in the Philippines).

Vernac. names.—Abaca (Philippines, *Saleeby, Edwards*); Manila Hemp.

Native of the Philippine Islands; cultivated experimentally in Jamaica, Trinidad, India, Andaman Islands, Borneo, etc., British East Africa and West Africa. In 1895 suckers were obtained by Kew through H.M. Consul at Manila for distribution to all the botanical establishments in the West Indies and West Africa (Kew Bull. 1895, p. 208).

This is one of the most important sources of the white fibres used for ropes and cordage, chiefly; but twine, fine fabrics and paper are also made from it, worn out ropes being suitable for the latter purpose. The best qualities of stout packing papers and other similar papers in the United States are made from old Manila ropes. The average of 132·4 tons of green weight per ton of paper given under Banana includes Manila Hemp stems (Clayton Beadle & Stevens, l.c.). Materials for ladies' hats and bonnets in Switzerland are made of Manila Hemp (Kew Bull. Add. Ser. vi. *Musa*, p. 63) Some 500,000 bales (about 275 lb. each) of fibre come into this country from Manila; the price in 1913 was £24–£90 per ton, and is now £57–£64 10s. per ton (Mon. Circ. Ide & Christie, Nov. 1913, Jan. 1920).

The plant may be propagated by seed, but usually plantations in the Philippines are increased by means of suckers, planted out when about 3 ft. high at distances of from 8–9 ft. apart. A rich open soil, thorough drainage and heavy rainfall are essential to success. The first crop is cut at the end of two years after planting, a full crop in the fourth year, the plantation continuing for from 15–20 years. The stems are cut for fibre just before flowering. After removal of the leaves, "each stem is then stripped or resolved into its component layers and these are again divided into strips or ribbons about 3 in. wide. Usually

each layer or leaf-sheath is divided into three strips. The outer layers contain a coarser and stronger fibre than the inner, while fibre from near the middle is of a fine silky texture, and capable of being utilised for purposes of spinning or weaving and made into articles of dress and ornament. The method of preparing the fibre is very simple, but effective; each strip, in a fresh succulent condition, is taken up by hand and drawn deftly between a blunt knife and a hard smooth board which are attached to a light portable frame; this process, repeated several times, if necessary, removes all the watery particles and pulp and there remains in the hands of the operator a beautifully white and lustrous fibre. The fibre is thoroughly dried in the sun and afterwards packed in bales for shipment" (Kew Bull. April, 1887, from a report by Consul Honey, Manila). Special care is taken in grading the several qualities which may vary according to variety, cultural conditions, etc.

The hand method of preparation does not seem to have been improved upon. Machines have often been tried with success, but owing to the abundant and cheap labour available they have so far, not been considered advantageous (l.c. 1895, p. 208). There is in the Museum at Kew an apparatus similar to that described above, which had been used in India (Ootacamund-Proudlock, 1904) for the preparation of Plantain fibre. The total weight is 22 lb. 4½ oz., that of the knife being 4 lb. 10½ oz.

Samples of the fibre grown in Trinidad from seed imported from the Philippines has been valued at £30 per ton when "fair current" Manila was at £25 per ton; fibre from the Nilgiris, India, said to be suitable for binder twine, has been valued (Oct. 1908) at £23-£24 per ton (Col. Rep. Ann. No. 601, 1909. p. 26) and Manila Hemp from the Belgian Congo, 4–5 ft. in length, with an analysis, normal for this fibre, was valued in London (May, 1917) at £35-£40 per ton. (Bull. Imp. Inst. 1917, p. 491). It would seem, therefore, that experiments might be carried out in Nigeria with some hope of success.

Ref.—"Manila Hemp (*Musa textilis*)" in Kew Bull. April, 1887, pp. 1–3.——"Manila Hemp in British North Borneo," l.c. 1892, p. 243; 1898, pp. 15–18.——"Manila Hemp Plants," l.c. 1895. p. 208.——*Ibid.* in Add. Series ii. "Vegetable Fibres," pp. 95–109.——"Manila Hemp," in Commercial Fibres: Their History and Origin, with Special Reference to the Fibre Industries connected with Her Majesty's Colonial and Indian Possessions, Morris, Journ. Soc. Arts, Reprint, 1895. pp. 17–18.——"De Manila-Hennep," Van Eeden, in Bull. Koloniaal Museum, Haarlem, March, 1895, pp. 3–9.——"Note sur la culture de l'Abaca aux Philippines," De Bérard, in L'Agric. prat. pays chauds, i. 1901–02, pp. 89–104.——"The Production of Hemp in the Philippine Islands," in Journ. Soc. Arts, l. 1902, p. 680.——"Manila Hemp," in The Propagation of Tropical Fruit Trees and Other Plants, Oliver, U.S. Dept. Agric. Bureau of Plant Industry, Bull. No. 46, 1903, pp. 23–26.——"Manila Hemp and the Fibre Industry of the Philippines," in Bull. Imp. Inst. ii.,

1904, pp. 48–50.——"Manila Hemp in Burma," Tropical Agriculturist, xxv. 1906, pp. 556–559.——"A Study of the Varieties of Abaca (Manila Hemp)," Saleeby, in The Philippine Agric. Review, ii. March, 1909, pp. 165–170.——Abaca (Manila Hemp), Edwards, Philippine Bureau of Agric., Farmers' Bull. No. 12, 1904 (Revise, 1910), pp. 1–29, illustrated.——"Abaca (Manila Hemp)," Saleeby, in The Philippine Agric. Review, iv. No. 6, June, 1911, pp. 298–307.——"Manilahanfkultur," in Der Tropenpflanzer, Beihefte, Nos. 5–6, Dec. 1912, pp. 447–458 and pp. 506–582.——"Manila Hemp from the Solomon Islands," Bull. Imp. Inst. 1915, pp. 23–24, with analysis.——"Abaca Fiber," Espino, in The Philippine Agriculturist & Forester, iv. Jan.–Feb. 1916, pp. 200–216.——"Manila Hemp," in Cotton and Other Vegetable Fibres: Their Production and Utilisation, Goulding, pp. 156–163 (John Murray, London, 1917).

BROMELIACEAE.

Ananas, Tourn.

Ananas sativus, *Schult.* f. Syst. vii. p. 1283.

Root fibrous with a rosette-like head of leaves arising from the ground. Leaves 30–50, 3–5 ft. long, about 2 in. wide at the middle, with prickly edges or smooth (as in "Smooth Cayenne"). Inflorescence a strobile. Fruit (syncarp) ovoid or pyramidal ½–1 ft. long, with a tuft of leaves (coma) at the crown, greenish to yellow when ripe.

Pine Apple.

Native of Tropical America; cultivated in many tropical countries, Asia, Africa, America, East and West Indies, Queensland, and some sub-tropical countries, Natal, Florida, and California.

Commonly grown for the fruit; but in certain countries, Philippines—for "Pina Cloth," and Formosa—for "Grass Cloth," Hainan and Java, the fibre from the leaves is of local value only, or as in Formosa exported only to China or neighbouring countries; there is no trade in this fibre with this country. The preparation of the fibre is a tedious hand process. In Hainan, 12 leaves or so gathered the first or second year from each plant are scraped on both sides, to remove the green tissues; the fibres are then alternately macerated in cold water for six hours and dried in the sun several times—lasting about 3 days. In the Philippines each layer of fibres is removed as it is exposed by the scraping—50–60 lb. of fibre is obtained per ton of green leaves. The combings from the fibre are said to give excellent results for paper making (see Kew Bull. April, 1887, p. 8; 1893, p. 208; Morris, Comm. Fibres, 1895, p. 19; Bull. Imp. Inst. 1916, pp. 437–460; Journ. Roy. Soc. Arts, 1917, p. 728; Goulding, Cotton & other Veg. Fibres, pp. 197–200). Attempts to use the leaves in Florida for fibre production have not (1907) given results that would warrant taking up the work on a commercial scale (Cycl. American Agric. ii, p. 292). A sample of fibre 6 ft.

long, in the Kew Museum (Derry, 1893) grown in Malacca, was stated to be worth £30 per ton delivered in London (Kew Bull. 1893, p. 368). Samples of fibre have been reported on by the Imperial Institute from S. Rhodesia (1903)—" very fine, white, well cleaned fibre of average length, 11 inches," the broker's report being " very strong, but very short " and if " of greater length would probably be worth from £30–£40 per ton " (Col. Rep. Misc. No. 58, 1909, p. 49), the Gold Coast (1907)—3½ ft. long, well-cleaned, soft, white, somewhat lustrous, of even diameter and of good strength, suggested for use as a flax substitute, nominal value £30 per ton (l.c. p. 51 : Bull. Imp. Inst. 1908, p. 242) and Northern Nigeria (1909)—" of fair quality and worth £16 £17 per ton " (Col. Rep. Ann. No. 656, 1910, p. 24 : N. Nig. Gaz. May 31st, 1911, p. 101).

The Pine-apple has been found to contain 11·7 per cent. of dextrose. In the Fed. Malay States wines or champagnes are reported to have been made, but apparently with little success (Kew Bull. 1912, p. 117). The manufacture of wine from Pine Apples has been discussed (Salles, Rev. Agr., Sao. Paulo, viii. No. 78, 1902, pp. 14–17—Note in U.S. Dept. Agric. Exp. St. Rec. xiv. 1902–03, p. 1102; Neuville, Journ. D'Agric. Tropicale, *seq.*) at various times and it is estimated that one ton of Pine-apple waste will produce 1700 lb. of juice in the process of canning, yielding 17 lb. citrate of lime and 20 gal. of molasses—and 100 lb. of dried pulp (U.S. Dept. Agric. Exp. St. Rec. xxii. 1910, p. 641). The expressed juice has been shipped from Dominica to the United States at a profit (Kew Bull. 1888, p. 211). Experiments have demonstrated the value of Pine-apple Spirit for motor fuel and it is reported that the California Fruit Packers' Corporation in Hawaii is preparing to make 1200 gallons of motor fuel from the refuse of its Pine-apple Cannery in Honolulu (Agric. News, Barbados, July 10th, 1920, p. 213). The active principle of the fruit is called " Anasine," which possesses active digestive properties and advantage has been taken of this in the manufacture of pine apple digester and in separating the active principle for medicinal purposes (Rolfs, Farmers' Bull, *seq.* p. 36).

The more important trade, however, is in the ripe fruit for canning purposes—done on a large scale in Florida, Straits Settlements, Australia, Bahamas, Hawaiian Islands, etc.—and for the fully developed fruit, cut green to ship for dessert purposes. It is advisable to ship in specially prepared crates, containing from about 18–42 according to the selected sizes of the fruit. Preserved fruit is largely imported from Siam, Hawaii, Florida, Straits Settlements, Australia, Natal, etc., and fresh fruit from the Azores—grown under glass—and Teneriffe. The Azores Pine-apple Trade, for long a famous source, appears to be declining, due, it is reported, to over-production and other causes (Journ. Roy. Soc. Arts. June 23rd, 1916, p. 573). The principal varieties are " Queen," " Smooth Cayenne," " Charlotte Rothschild "—all of which have been extensively propagated by the Agricul-

tural Department of Nigeria at Old Calabar, Lagos, and Oloke Meji and regularly distributed—"Green Ripley"—with the two last-mentioned varieties under cultivation at the Botanic Garden, Victoria, Cameroons (Deistel, Trop. Gart. p. 47)—"Red Spanish," and "Natal"—a small variety largely used for canning; fruit often not over 6 in. long, very desirable and just large enough to serve at a dinner-table; origin not known, though in cultivation many years in Natal (Fairchild, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 25, 1903, p. 20). It is probable that this is the same as referred to in many parts of tropical Africa, growing practically wild—in Nigeria there is a "bush" variety of which the origin would be difficult to trace, and mention is made (Agric. prat. pays chauds, i. 1901–02, p. 158) of a local variety—grown with improved varieties "Baronne de Rothschild," "Comte de Paris," and "Enville" cultivated in the Botanic Garden at Conakry in French Guinea. The "Natal Canning" is grown in the Philippines and is said to bear fruit averaging 1 kilo in weight, 10 cm. by 14 cm. in size, with an almost entire absence of fibre and possessing very little acidity (Philippine Agric. Rev. 1912, p. 32). The "Red Spanish" is the variety most extensively grown in the United States (Kew Bull. 1893, p. 208; Agric. News, Barbados, June 16th, 1906, p. 178) and it is the popular fruit for canning purposes in the Bahamas (Agric. News, l.c.) The two leading varieties in Porto Rico are "Cabezona," (the "Porto Rico" variety of Florida)—one of the largest varieties grown, 12–15 lb. being a common weight—and "Red Spanish" —small to medium (Henricksen & Iorns, Philippine Agric. Rev. 1910, p. 300).

The cultivation is comparatively easy; propagated usually by suckers from the base of the plant; but may also be increased by seeds, offsets from the base of the fruit, or tops of the fruit, though as a rule this is not advisable, the plant suckers being more reliable and coming to maturity in from 12–18 months. Plants are reported to fruit in 12 months after being planted at Oloke Meji (Kew Bull. 1908, p. 200). Seeds would only be profitable when raising new varieties. Given a light well-drained moderately rich soil, a hot climate and a fair amount of moisture, the plants grow freely. It is not recommended to grow plants for fruit and fibre at the same time; the leaves of the semi-wild plants are better suited for fibre purposes (Morris, l.c.) and the improved varieties as enumerated above for fruit.

Ref.—"Pine Apples," in The Fruit-Growers' Guide, Wright, iii. pp. 154–170 (Virtue & Co., Ltd., London, 1892).——Pine Apple Fertilizers, Rolfs, U.S. Dept. Agric. Florida Agric. Exp. Station, Bull. No. 50, 1899, pp. 1–104.——Pine Apple Growing, Rolfs, U.S. Dept. Agric. Farmers' Bull. No. 140, 1901, pp. 1–47. ——Report on the Cultivation of Pine Apples, Florida, Thomson, Jamaica Board of Agric. pp. 1–9 (Govt. Printing Office, Jamaica, 1901).——"The Pine Apple," in Historical Notes on Economic Plants in Jamaica, Harris, Bull. Bot. Dept. Jamaica, viii. Sept. 1901, pp. 131–139.——"*Ananassa sativa*, Ananas" ("Jardin

d'essai de Conakry "), Teissonier, in L'Agric. prat. pays chauds, i. 1901–02, pp. 148–151.——" The Natal Pine Apple," Fairchild, U.S. Dept. Agric., Bureau of Plant Industry, Bull. No. 25, 1903, pp. 20–22.——" Crates for Pine-Apples," Agric. News, Barbados, May 9th, 1903, p. 148.——" Vin d'Ananas," Neuville, in Journ. D'Agric. Tropicale, iii. 1903, pp. 70–72.——" Ferment of the Pine Apple," (" Notes on Recent Work on Vegetable Ferments "), Freeman, in West Indian Bull. iv. No. 1, 1904, pp. 24–25.——" Pine Apples," in Agric. Bull. Fed. Malay States, iii. Jan. 1904, pp. 1–6; Feb. 1904, pp .37–40.——Pine Apple Culture, Hume & Miller, U.S.Dept. Agric., Florida Agric. Exp. Station, Bull. No. 68, 1903, I. Soils, pp. 669–698, and Bull. No. 70, 1904, II. Varieties, pp. 36–62, pls. x–xiv.—fruits of the varieties " Egyptian," " Golden," " Pernambuco," " Abachi," " Cayenne," " Enville," " Rothschild," " Blood," " Porto Rico " and " Prince Albert," and including analyses of the edible portion of different varieties. ——" Pine Apples," in Agric. Bull of the Straits & Fed. Malay States, iii. Jan. 1904, pp. 1–6 and " Pine Apple Cultivation," l.c. Feb. 1904, pp. 37–40, illustrated.——" Canning Pine Apples," Agric. News, Barbados, v. June 16th, 1906, pp. 177–178.——" The Cultivation of Pine Apples," Sawer, in Natal Agric. Journ. x. May, 1907, pp. 495–499.——" Pine Apple Growing in the West Indies," Lucas, in West Indian Bull. viii. No. 2, 1907, pp. 151–166.——Ananas, Hubert, pp. 1–192, illustrated (H. Dunod & E. Pinat, Paris, 1908).——" *Ananas sativa*," in Comm. Prod. India, Watt, pp. 66–69.——" Pine Apple Growing in Porto Rico," Henricksen & Iorns, in Philippine Agric. Review, iii. 1910, pp. 294–302; pp. 350–354.——Diseases of the Pine Apple, Larsen, Hawaiian Sugar Planters' Association, Honolulu, pp. 1–70, illustrated.——" Pine Apple Culture in Natal, " Johansen, in Agric. Journ. Union of S. Africa, ii. July, 1911, pp. 88–92.——" Pine Apple Culture," Wester, in Philippine Agric. Review, v. 1912, pp. 530–543.——" The Cultivation of the Pine Apple for Fruit and Fibre," Bull. Imp. Inst. xiv. 1916, pp. 437–460.——" Decline of the Pine-Apple Industry in the Azores," Journ. Roy. Soc. Arts, lxiv. p. 573.——" Pine-Apple Seedlings," in Agric. News, Barbados, xvi. Dec. 29th, 1917, p. 415.——" Pine-Apple Growing in South Africa," Journ. Roy. Soc. Arts, lxv. 1917, pp. 536–537.——" Surma Valley Pine-Apples," l.c. p. 538.

IRIDEAE.

Gladiolus, Linn.

Gladiolus multiflorus, *Baker*; Fl. Trop. Afr. VII. p. 369.

Zungeru, Angola.

In Meadows, *Zungeru* (Dalziel, No. 253, 1906: Comm. Imp. Inst. Herb. Kew) and in woods Angola (Welwitsch, Herb. Kew).

Gladiolus quartinianus, *A. Rich.*; Fl. Trop. Afr. VII. p. 371.

Ill.—Bot. Mag. t. 6739; Gard. Chron. Dec. 31st, 1898, p. 467, f. 140 (var. *superbus*); Pobéguin, Fl. Guin. Franç. t. 46.

Vernac. names.—Ocperdo (Bassa, *Lamb*); Rumeni (Hausa, *Lamb*); Rumana (Hausa, *Dalziel*).

Oloke-Meji, Yola, Bassa, and also found in Portuguese East Africa. Corm edible (Dalziel, Hausa Bot. Voc. p. 82); it is pounded up with water and guinea-corn flour in which it is drunk and much esteemed as a cooling beverage in Bassa (Lamb, No, 88, Herb. Kew). Cultivated by the Igara in Bassa (l.c.); abundant, Kilba bush, Yola (Dalziel, No. 250, 1909, Herb. Kew); found in very wet land, Msala River, Nyassa (Allen, No. 135, Herb. Kew). The var. *superbus* figured in the Gardeners' Chronicle (l.c.) came from Delagoa Bay, flowered by Mr. Tillett, of Norwich, named at Kew; the colour of the flowers is yellow, deeply flushed with crimson.

Gladiolus spicatus, *Klatt*; Fl. Trop. Afr. VII. p. 369.

Vernac. names.—Rumena (Lokoja, *Elliott*); Rumana (Hausa, *Dalziel*); Yarney? (Gold Coast, *Ward*); Nupe, Jeba, Zungeru, Lokoja.

Corm edible (Dalziel, Hausa, Bot. Voc. p. 82); eaten, Lokoja (Elliott, No. 193, 1907, Herb. Kew), various medicinal uses are attributed to a *Gladiolus*, probably this species, on the Gold Coast (Ward, Pharm. Journ. March 17th, 1900, p. 280).

Found in open uplands and meadows, Zungeru (Dalziel, No. 252, Herb. Kew, Comm. Imp. Inst. Oct., 1906).

The root of *G. zambesiacus*, Baker, is also eaten in Njelekwa, E. Africa, where the plant is common on highlands (Archd. Johnston, No. 317, Herb. Kew).

AMARYLLIDEAE.

Haemanthus, Linn.

Haemanthus cinnabarinus, *Decaisne*; Fl. Trop. Afr. VII. p. 390. Bot. Mag. t. 5314 (figured (1862) from bulbs sent to Kew by Gustav Mann from Ambas Bay at the foot of the Cameroon Mts.); referred to in the Floral Magazine of Feb. 1877 (p. 245) as "one of the rarest and when well-grown, most gorgeous of all bulbous plants and as such is deserving of more extended cultivation in our gardens"; widely distributed in West Africa including S. Nigeria and the Cameroons.

Haemanthus multiflorus, *Martyn*; Fl. Trop. Afr. VII. p. 388. Bot. Mag. t. 961 (1806), t. 1995 (1818) t. 3870 (1841; *H. tenuiflorus*, var.)—bulb said to be "poisonous for pig," Sierra Leone (Scott Elliot, No. 5540, Herb. Kew), known from Lagos, Yoruba, Bornu, and Cameroons. **Haemanthus rotularis,** *Baker*; Fl. Trop. Afr. VII. p. 390, found in the forests of Yoruba, and **Haemanthus rupestris,** Baker, l.c. p. 388, "Albasar Kwadi" of the Hausas (Dalziel, Hausa, Bot. Voc. p. 8), known from Nupe, in rocky places (Barter, Herb. Kew), Kontagora—amongst rocky hills (Dalziel, Herb. Kew), Yola, Lokoja and Sokoto, are all only of ornamental value, conspicuous for their bright red or scarlet

flowers, and the first two have been known in European Gardens for almost a century.

Crinum, Linn.

Crinum giganteum, *Andr.*; Fl. Trop. Afr. VII. p. 404; Bot. Mag. t. 5205 (1860), with a large bulb 5–6 in. diam. large leaves 2–3 ft. long and large white flowers faintly lined with red, known from Lagos, Nupe—near water (Barter), Oban, and Calabar. **Crinum natans,** *Baker*; Fl. Trop. Afr. VII. p. 396; Bot. Mag. t. 7862; bulbs small, leaves about 3 ft. long, flowers white, usually found in running water—leaves floating on the surface, beyond the tidal influence and known from the Niger, Old Calabar, Cameroons, Sierra Leone. **Crinum pauciflorum,** *Baker*; Fl. Trop. Afr. VII. p. 399; known from Yola—in marshes (Dalziel, Herb. Kew), Chari region. **Crinum podophyllum,** *Baker*; Fl. Trop. Afr. VII. p. 403; Bot. Mag. t. 6483—bulbs sent from Old Calabar by the Rev. Hugh Goldie; flowered at Kew for the first time in November, 1879; bulb sub-globose; leaves about 1 ft. long, 2–3 in. broad at the middle. **Crinum purpurascens,** *Herb.*; Fl. Trop. Afr. VII. p. 396; Bot. Mag. t. 6525; bulb, 2 in. diam.; flowers white, star-shaped and sweet scented; Lagos—an aquatic plant (Millen, Herb. Kew), Bonny—open savannah, dry spaces (Kalbreyer, Herb. Kew), Niger Delta, Jeba, etc. **Crinum Sanderianum,** *Baker*; Fl. Trop. Afr. VII. p. 400; Bulb globose, 2 in. diam., leaves up to 2 ft. long, 1–1½ in. broad; Lagos, Sierra Leone—very common in wet places (Scott Elliot, Herb. Kew). **Crinum yuccaeflorum,** *Salisb.*; Fl. Trop. Afr. VII. p. 399. Bot. Mag. t. 2121 (*C. Broussonetii*), " Albasar Kwadi " (Hausa, Dalziel, Hausa Bot. Voc. p. 7, and other species). " Isumeri " (Lagos, Dawodu, Herb. Kew). Bulb globose, medium sized, leaves, 1–1½ ft. long, flowers large white with a distinct band of red down the back. Found in Nupe—grassy valleys and swampy places (Barter, Herb. Kew), Abinsi and common all over N. Nigeria (Dalziel, Herb. Kew). Excepting this species which Dawodu (l.c) states is much used in medicine in Lagos, all the above-mentioned *Crinums* appear to be of ornamental value only, or as " plante fetiche " in many African villages (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 341).

Agave, Linn.

Agave americana, *Linn.* Sp. Pl. (1753) p. 323.

Acaulescent. Leaves usually 30–40, sometimes 50–60 in a rosette, oblanceolate-spathulate 3–6 ft. long, 6–9 in. broad above the middle, narrowed to 4–5 in. above the base, glaucous green, end spine 1½–2 in. long. Peduncle with panicle 24–36 ft. long (Baker, Amaryllideae, p. 180).

Native of Mexico. Cultivated in Botanic Gardens, West Africa, Belgian Congo, etc. Leaves yield a fibre of secondary value. The plant is grown in many hot countries for ornament.

Extensively planted as a fence plant in the Canaries where the pulpy portion of the leaves is fed to cattle and the leaves are used as thatch (Morris, Pl. & Gardens, Canary Is. Journ. Roy. Hort. Soc. 1896, p. 92).

Propagated by bulbils which develop on the flowering spike, easily grown under conditions suitable for Sisal—described below.

Agave sisalana *Perr.* (*Agave rigida*, Miller, var. *sisalana*).

A low growing plant, short rootstock, with a rosette like head. Leaves, pale green, fleshy, 3–6 ft. long; 3–5 in. wide in the middle, edges usually smooth with a terminal spine. Inflorescence a scape 12–25 ft. high; flowers about $2\frac{3}{5}$-in. (Dewey); bearing numerous bulbils.

Ill.—Dodge, U.S. Dept. Agric. Fiber Investig. Rep. No. 3, 1891, t. 1; Agric. Gaz. N.S. Wales, iii. 1892, t. 47; Mulford, 7th Rep. Missouri Bot. Gdn. 1896, tt. 54–56; Queensland Agric. Journ. iii. 1898, t. 48; Sem. Hort. 1900, pp. 329–333; Shattuck, Bahama Is. t. 40; Agric. Gaz. N.S. Wales, xviii. 1907, pp. 907–909, ff. 1–3; 19th Rep. Missouri Bot. Gdn. 1908, t. 29; Bull. Agric. Congo Belge, iii. 1912, ff. 315–321; Trelease, Mem. Nat. Acad. Sci. Washington, xi. 1913, tt. 113–115; Philippine Agric. Rev. vi. 1913, t. 2; vii. 1914, tt. 2–5; Garten-Zeitung (Berlin), 1914, p. 14; Bull. Agric. Congo Belge, vi. 1915, p. 43, f. 18 (field—19 months old plants).

Vernac. names.—Yaxci (Maya Indian, *Dewey*); Yaxci (Yucatan, *Morris*); Pita (Bahamas, *Morris*); Henequen Verde (Spanish, *Dewey*); D'Aloes Bleu (Mauritius, L'Agric. Col. Paris, ii. 1914, p. 53).——Sisal Hemp.

Native of Central America. Cultivated in the Bahamas, India, East Africa, East and West Indies, Fiji, &c. and experimentally at the Botanic Stations in West Africa—in lists. Old Calabar 1897–99; growing at Oloke-Meji (Kew Bull. 1908, p. 200) and in list of plants available for distribution, Gold Coast, 1910—naturalised in Florida.

The principal commercial sources are the Bahamas, Turks & Caicos Islands, Java, East Africa, Bengal, Natal, Mexico, etc. The value in 1913 per ton, was for Indian £17–£27; Mexican £26 10*s*.–£27 10*s*.—Mexico supplying 824 tons in that year to the United Kingdom; but large quantities are also shipped t the United States. This country is mentioned more particularly as being the principal source of "Sisal" but the figures generally, being recorded under the broad term "Hemp," they may include other *Agave* fibres—excepting perhaps British East Africa and the Bahamas, our most successful colonies in the production of sisal fibre and the greater part of the Bahamas produce from 2000–3000 tons approximately, a year—goes to the United States. The first shipment from B. E. Africa arrived in London at the end of 1911, when it was reported that about 5000 acres had been planted that were expected to produce within two years

about 5000 tons a year (Wigglesworth, specimen in Mus. Kew letter to Director dated Jan. 1st, 1912).

The plant is propagated by bulbils, which may be grown on in nurseries till about 1 ft. or so high—"set out 8 or 9 inches apart each way in nursery beds, in six months they will attain a growth of 8–12 in. and they may then be transferred to the field" (Kew Bull. 1892, pp. 21–40)—or by suckers arising from the rootstock, planted out at from 8–9 ft. apart. Well-drained soil (containing a good proportion of limestone) and a dry hot climate are necessary conditions. The plant in Jamaica was grown for many years; but failed when cultivated on alluvial soils owing to poling prematurely and it has been found that it can be grown with success and profit on a limestone soil in dry hot districts (Col. Rep. Ann. No. 820, 1914, p. 13). In Yucatan the soil in the fibre producing districts is gravelly and stony, varying in colour—black, brown and red, underlaid by soft limestone rock at an average depth of about 8 in. (Kew Bull. Add. Ser. ii. p. 173). The plants mature in from 3–5 years, when approximately 25–50 leaves may be safely taken from each plant during a year, and "under good conditions leaves produce about 3½ per cent. clean dry fibre, whiter and stronger than Henequen" (Dewey, *seq.*). In Jamaica 5–9 per cent. is obtained—the higher percentage in very dry weather (Agric. News, Barbados, April 25th, 1914). The leaves are cut from below when full length; but should not be less than 3 ft. and cutting may go on until the plants pole or flower, a period which may vary from 6 or 10 years to more than 20 according to climate. In East Africa the short period of 2–3 years for cutting is recorded (Kew Bull. 1908, p. 300) or the life of the plant in East Africa is put at 6½ years, reaching maturity in the third year and cutting for nearly 4 years before poling (Heron, Trop. Life, March, 1918, p. 35; Agric. News Barbados, 1918, p. 238). The leaves are tied in bundles and conveyed to the mill which should be conveniently situated near a good supply of water. The cleaned fibre is hung on lines to dry and bleach and then baled for shipment. On most plantations where the plant is grown commercially machinery is used and it is only on a scale sufficiently large to require machines for cleaning that the cultivation would be likely to pay although—when a supply of salt water is available—a simple process suitable for peasant labour is mentioned in Kew Bull. 1894, p. 413 as being adopted throughout the Bahamas. It "consists of a slit being made in the thick end of the leaf, when it is torn asunder, leaving the inner part exposed, and by then soaking it in salt water, which is never far to reach; in about a week the pulp may be removed by hand and the fibre preserved," the output for one man being 50–60 lb. of fibre per day. The "Mexican Fibre" or "Istle" (*Agave heteracantha*, Zucc.)—which comes into the London Market for use in the manufacture of cheap nail and scrubbing brushes and as a substitute for animal bristles—is produced by hand—but

the fibre is prepared from wild plants (Kew Bull. Dec. 1887, pp. 5–7; 1890, pp. 220–224). There are several machines on the market. In East Africa the "Molla" machine—used to some extent in Yucatan; of 48 h.p. and capable of treating 85,000–120,000 leaves in 10 hours—requires the produce of at least 600,000 plants covering over 300 acres to keep it going profitably (l.c. 1908, p. 301); in Yucatan one fibre machine is stated to be required for every 100 acres (l.c. March 1887, p. 7); in Jamaica one machine (Finnigan Zebriske & Co. Patterson, N.J., U.S.A.) of 12–14 h.p. takes 4000 leaves per hour—one man feeding the leaves and one girl taking off the clean fibre (Agric. News Barbados, April 25th, 1914, p. 134); in the Bahamas 2600 acres of one company occupy two factories and two machines, output about 68 tons, and 1250 acres in bearing of another company are stated to have three factories and two machines—1 Todd and 1 Villamor in use; output about 79 tons (Col. Rep. Ann. No. 496 (1906) for 1905–06, p. 13; Agric. News, Barbados, Jan. 6th, 1906, p. 11) for preparation of the fibre. The above remarks on machinery are quoted only to give some indication of the requirements and for fuller particulars reference should be made to the papers in Kew Bulletin and other papers quoted below on the subject.

The more important species cultivated in Yucatan, Mexico, is *Agave fourcroydes*, Lemaire (*Agave rigida* Mill. var. *elongata*, Jacobi), "Henequen," "Sacci" or "Sacqui," also known as "Sisal," of which a plant from Yucatan was received at Kew in May 1890; it was dead on arrival and kept as a Museum specimen (now in No. iii. Museum). It differs principally in the length of stem (4 ft. below the leaves) and in having small black teeth about an inch apart along the edges of the leaves (Kew Bull. 1892, p. 22). This plant is reported by Dewey (Verslag van het Veselcongres . . . Soerabaia, 8th July 1911; West Indian Bull. xvi. No. 2, 1917, p. 104) to be the only species cultivated in Yucatan for the production of fibre for export and that it furnishes more than 90 per cent. of the Sisal fibre of commerce. The plant under consideration, however, appears to be better known and more widely distributed under cultivation and in Yucatan the "Yaxci" (*A. rigida*, var. *sisalana*) is said to furnish the best quality fibre and the "Sacci" or "Sacqui" (*A. fourcroydes*: syn. *A. rigida*, Mill. var. *elongata* Jacobi) the largest quantity of fibre (Kew Bull. March 1887, p. 4).

In Nigeria it is probable that any development in the cultivation would be more profitable in the Northern Provinces. In Ilorin it is reported (Ann. Rep. Dept. Agric. N. Nig. 1914, p. 16) that the growth was good of 2 acres of Sisal planted with suckers from Zungeru on June 23rd, 1914, and in the same province (1917) the growth of the crop first planted was reported as entirely satisfactory and ready for cutting. Extraction by hand on a small scale had been done and some excellent rope had been produced. A machine had been obtained for extracting

the fibre (Thornton, l.c. 1917, p. 16). The plant was grown on a small scale at Old Calabar in 1897 and samples of fibre prepared from plants well established at Oloke-Meji were exhibited at an Agricultural Show held by the Department, 1906 (Col. Rep. Misc. No. 51, 1908, p. 47). There are samples of twine made of this fibre in the Museum, from Old Calabar (Johnson and Warren, 1918).

In 1918 the leaves of the Sisal planted in 1914 measured up to 5 ft. when it was reported " the plants are now poling very extensively; there has, however, been time to reap the usual three crops of leaves during the lifetime of the plants, so that as regards the length of leaves and time of poling sisal shows itself to be satisfactory for this country " (Thornton, Ann. Rep. Agric. Dept. N. Prov. Nigeria, for 1919, p. 19). Although successful so far, the Director of Agriculture advised that " as the production of sisal hemp in commercial quantities is adapted to large planters rather than to the small cultivator, it is doubtful whether further development may be looked for in this direction " (Lamb, l.c., p. 4).

Ref.—" Sisal Hemp," in Kew Bull. Add. Series ii. " Vegetable Fibres," pp. 130–192; Reprints of various papers in Kew Bull. 1887–1896.——" *Agave* " in Dict. Econ. Prod. India, Watt, i. 1889, pp. 133–144.——A Report on Sisal Hemp Culture in the United States with Statements relating to the Industry in Yucatan & the Bahama Islands, and Machinery, Dodge, U.S. Dept. Agric. Fiber Investigations, No. 3, 1891, pp. 1–59, illustrated.——Report on the Henequen Hemp Industry at Yucatan, Dip. & Cons. Rep. Misc. No. 236, 1892, Mexico; Reprint in Kew Bull. 1893, pp. 212–218.——" Sisal Hemp " and " Bahamas Pita," Morris, in Journ. Soc. Arts, 1895, pp. 918–921.——" The Sisal Industry in the Bahamas," Morris, in Journ. Soc. Arts, xliv. March 20th, 1896, pp. 407–418.——" *Agave* " in A Descriptive Catalogue of the Fiber Plants of the World, Dodge, U.S. Dept. Agric. Fiber Investigations, Rep. No. 9, 1897, pp. 41–53.——Sisal Hemp: Experimental Cultivation of the Plant in India, Prain, Agric. Ledger, No. 6, 1900, pp. 47–68.——" *Agaves*," Nelson, in Year Book, U.S. Dept. Agric. 1902, pp. 313–320.——Sisal Hemp Culture in the Indian Tea Districts, Mann & Hunter, pp. 1–41; plates i.–ix, including particulars and illustrations of machinery (Indian Tea Assoc. London & Calcutta, 1904).——" The Sisal Hemp Industry," in West Indian Bull. v. No. 2, 1904, pp. 150–172.——*Agave & Furcraea*, Drummond & Prain, in Agric. Ledger, No. 7, 1906, pp. 77–271.——The Development of Sisal Hemp Cultivation in India,—Mann, in Agric. Journ. India, ii. 1907, pp. 323–333.——" Sisal Hemp (*Agave sisalana*)," Haywood, in Agric. Gaz. N.S. Wales, xviii. Dec. 2nd, 1907, pp. 907–909, illustrated.——" *Agave rigida*," Trelease, in 19th Rep. Missouri Bot. Garden, 1908, pp. 273–279.——" *Agave*," in The Comm. Products, India, Watt, pp. 39–45 (John Murray, London, 1908).——" Cultivation of Sisal Hemp in German East

Africa," Kew Bull. 1908, pp. 300–302.——" Sisal Hemp and Mauritius Hemp," in The Handbook of Nyasaland, pp. 197–199 (Wyman & Sons, London, 1910).——" Note sur la Culture des Principaux Agaves Textiles," Miny, in Bull. Agric. Congo Belge, iii. 1912, pp. 430–459.——" Review of the Sisal Industry in the East Africa Protectorate," Powell, in Ann. Rep. Dept. Agric. B.E. Africa, 1912–1913 : App. B. pp. 72–78.——Maguey & Sisal Culture, Saleeby, in Philippine Agric. Review, vi. May 1913, pp. 207–222.——" Sisal Hemp in Fiji," Kew Bull. No. 6, 1913, pp. 231–233.——" Hemp : Sisal-Henequen," Cousins, in Journ. Jamaica Agric. Soc. xviii. Aug. 1914, pp. 334–336.——" *Agave sisalana* & *A. fourcroydes* in Jamaica," Kew Bull. 1914, pp. 350–352.——Sisal Hemp : Its Cultivation, Preparation, and Utilisation, Bull. Imp. Inst. xiii. 1915, pp. 430–446 with illustr. of machinery.——" Sisal Hemp," l.c. 1917, pp. 485–488.——" Sisal Hemp," in Cotton and Other Veg. Fibres : Their Production & Utilisation, Goulding, pp. 166–180 (John Murray, London, 1917).

Furcraea, Vent.

Furcraea gigantea, *Vent.* in Bull. Soc. Philom. i (1793) p. 65.
A low growing plant, sometimes developing a stem 2–4 ft. high with a rosette-like head of upwards of 50 leaves—4–7 ft. long, 4–6 in. across the middle, thick, fleshy, with a short terminal spine, otherwise usually unarmed. Inflorescence a central scape, 20–30 ft. high bearing comparatively small greenish-white flowers and numerous bulbils.

Ill.—Bot. Mag. t. 2250; Wight, Ic. Pl. Ind. Or. t. 2025; De Candolle, Pl. Grass. t. 126; Natal Agric. Journ. x. May 1907, p. 529 (plants 5 months old); Agric. Journ. Union S. Africa, v. 1913, pp. 818, 820, tt. 62, 63; Bull. Agric. Congo Belge, iii. 1912, p. 433, f. 317; vi. 1915, p. 41, f. 15 (plants 21 months old).

Vernac. names.—Aloe or Aloes vert (Mauritius, *Bojer*, *Horne*, *Morris*, *Stockdale*); Fique (Colombia, *Dawe*); Fique (Venezuela, *Ernst*); Aloe (Natal, *Sim*, *Medley Wood*).—Mauritius Hemp, Giant Lily (*Dodge*).

Tropical America : introduced to Mauritius, Ceylon, India, St. Helena, Belgian Congo, Natal, East and West Africa—21 plants, received at Old Calabar, from Kew, 1896 (Am. Rep. Bot. Gdns. 1896–7), growing at Oloke Meji (Kew Bull. 1908, p. 209) and in list of plants available for distribution Gold Coast 1910—Queensland, West Indies, Algeria, etc.

A cordage fibre. In Colombia the fibre is used for the soles of Alpargatas (or shoes), for making sacks for the transport of coffee, charcoal, maize and produce generally, for pack-saddles, girths for transport mules and bullocks, and for the manufacture of ropes, cord, matting and cash bags. The green leaves are used in this country for thatching (Kew Bull. 1916, p. 169).

The commercial sources of the fibre to the United Kingdom are Mauritius—5647 bales shipped in 1917; 1974 bales (reduction due to lack of tonnage) shipped in 1918 (Ann. Rep. Dept. Agric.

Mauritius, for 1918, p. 5)—St. Helena and Natal; value in 1913, £25–£29; 1915, £34–£35 (Kew Bull. 1917, p. 282) and in Dec. 1919, £40–£44 for "Common," £50–£53 for "Fair" and £57–£60 per ton for "Prime" (Mon. Circ. Ide & Christie, 15th Dec. 1919). A sample of fibre from S. Nigeria was valued (1908) at about £28 per ton (Col. Rep. Ann. No. 601, 1909, p. 30). Fibre prepared from plants well established at Oloke-Meji was exhibited at an Agricultural Show, Lagos, 1906 (Col. Rep. Misc. No. 51, 1908, p. 47).

Two samples of Mauritius Hemp grown at Lokoja and Zungeru, N. Nigeria, were described as "well prepared, of pale cream colour and of good strength," the value of similar fibres in the United Kingdom (Dec. 1915) being estimated at £32 per ton, if shipped in quantity and of regular length—measuring not less than 4 ft. (Nig. Gaz. July 20th, 1916, p. 431).

In Colombia the plant is grown everywhere in the sub-tropical parts, but especially in the districts of limestone formation (Kew Bull. l.c.). In general the propagation, cultivation and preparation may be regarded as the same as for "Sisal" (*q.v.*) but the following particulars furnished by the Director of Forests and Gardens in Mauritius to the Department of Agriculture in Natal, may be of interest "The Aloe leaves can be cut about 4 years after the plants are laid out, a second crop 10 months later, a third 15 and a fourth 18 months after and so on every 18 months until the Aloe plants send up their shoots or poles which bear bulbils in great quantities for reproduction and the plants die." "Plants are laid out 4 × 4 ft. or 5 × 5 ft. according to soil and climate." "One acre of planted Aloes can give about 60,000 leaves yielding a ton of dry marketable fibre" (Natal Agric. Journ. ix. 1906, p. 1204). It is probable that considering the length of leaf when fully developed, the distance apart in the field may require to equal that given for Sisal, in a tropical climate. The local methods of extraction do not so far appear to have been superseded by machinery. "Experiments with the Corona fibre machine during the year (1918) indicate that the machine can after suitable adjustment quite satisfactorily decorticate 'Furcraea' fibre, on the other hand the output of fibre is very much less than that which is obtained when 'Sisal' is dealt with and on this account the value for 'Furcraea' is discounted in comparison with the local grattes" (Ann. Rept. Dept. Agric. Mauritius, l.c.).

Ref.—"Mauritius Hemp," Kew Bull. March 1887, pp. 8–10. ——"Mauritius Hemp Machines," l.c. 1890, pp. 98–104 and in Add. Series ii. "Veg. Fibres," pp. 208–217.——"Mauritius Hemp," Morris, in Journ. Soc. Arts. xliii. 1895, p. 922.—— "*Furcraea gigantea*," in Useful Fiber Pl. of the World, Dodge. U.S. Dept. Agric. Fiber Investig. Rep. No. 9, 1897, p. 169.—— "*Furcraea gigantea*," Bull. Imp. Inst. ii. 1904, p. 84, fibre from Zomba, with analysis.——"*Furcraea gigantea* Fibre from India," l.c. iii. 1905, pp. 142–144.——"*Agave* and *Furcraea* Fibres from

Madras," l.c. iv. 1906, pp. 23–29.——"The Literature of *Furcraea* with a Synopsis of the Known Species," Drummond, in 18th Rep. Missouri Bot. Garden, 1907, pp. 25–75.——"Sisal, Mauritius Hemp and other 'Aloe' Fibres," Sim, in Natal Agric. Journ. x. July 1907, pp. 743–756 with illust. of machinery.——"Fibre Cultivation (Sisal-Agave, *Fourcroya gigantea* and Ramie)," Rositzky, l.c. x. March 1907, pp. 210–215.——"Fibre": Harper & Rositzky, l.c. pp. 219–223.——"The Fibre Industry of Mauritius," Acutt, in Natal Agric. Journ. x. Oct. 25th, 1907, pp. 1199–1207 including "Natal's Possibilities," pp. 1207–1210.——"The Fibre Industry," Acutt, l.c. xi. Dec. 24th, 1908, pp. 1540–1542.——"Mauritius Hemp," Bull. Imp. Inst. viii. 1910, pp. 265–273.——"In Sub-Tropical Natal: The Home of [Aloe] Fibre," Agric. Journ. Union of S. Africa, v. June 1913, pp. 817–826.——"L'Aloes Vert (*Fourcroya gigantea*) a Maurice," in L'Agronomie Coloniale, iii. Feb. 1914, pp. 52–53.——"Mauritius Hemp from Rhodesia," Bull. Imp. Inst. xiii. 1915, pp. 21–22.——The FibreIndustry of Mauritius, Stockdale, Dept. Agric. Mauritius, Bull. No. 5, 1915, pp. 1–15.——"Fique (*Furcraea gigantea*)," Kew Bull. 1916, pp. 169–170.——"*Furcraea* Fibre from Southern Rhodesia," Bull. Imp. Inst. xv. 1917, pp. 16–17.——"Mauritius Hemp"—from the Belgian Congo, l.c. pp. 490–491.——"Mauritius Hemp," in Cotton and Other Veg. Fibres, Goulding, pp. 181–185.

TACCACEAE.

Tacca, Forst.

Tacca pinnatifida, *Forst.*; Fl. Trop. Afr. VII. p. 413.

Ill.—Forster, Gen. Char. Pl t. 35; Gaertner, Fruct. Sem. Pl. i. t. 14; Lam. Encycl. t. 232; Lodd. Bot. Cab. t. 692 (germinating seeds); Schnizlein, Ic. t. 58; Bull. Soc. Nat. d'Accl. France, 1892, i. p. 375 (*T. pinnatifida*), p. 378 (*T. involucrata*); Bot. Mag. tt. 7299–7300; Gartenfl. xvii. 1868, p. 582; Tropenpfl. 1905, pp. 123, 125; Bailey, Cat. Queensland Pl. ff. 533–34 (var. *Brownii*); Notizbl. Bot. Gart. Berlin, No. 45, 18th Nov. 1905, App. xxii. p. 53, f. 22.

Vernac. names.—Amara, Giginiar biri, Tera Yayu (Hausa, *Dalziel*); Bugulli (Fufulde, Yola, *Dalziel*); Pia (Tahiti, Foreign Office, specimen in Mus. Kew).—Tacca Arrowroot, Fiji Arrowroot, South-Sea Arrowroot.

Lagos, Nupe, Katagum and Zungeru in Nigeria also known from Abyssinia, Gaboon River, Congo, Mozambique, East Africa and B. C. Africa. Native of Polynesia. Tubers received at Kew in 1890 from Fiji were distributed to the botanical departments of Lagos, Jamaica, Trinidad, etc.

The arrowroot or starch obtained from the root is an important food of the Natives of the South Sea Islands, and "the Queensland aborigines" (Bailey, Cat. Queensland Pl. p. 548); tubers eaten, Nupe (Barter, Mus. Kew); recognised as a food by the Fulani and of such pagans as occupy the lower

grounds, Yola, but never cultivated (Dalziel, Kew Bull. 1910, p. 140) except "in some districts, chiefly by the Fulani"; gathered wild in the Benue district and sold in the form of a starchy meal (Dalziel, Hausa Bot. Voc. p. 9). A sample of Tacca Arrowroot from the East Africa Protectorate was submitted to commercial experts (Oct. 1905) who stated that it would be readily saleable as a cheap manufacturing arrowroot at about 13*s*. 6*d*.–14*s*. per cwt. and as an arrowroot it would be considered rather poor and would compete with cheap grades of St. Vincent Arrowroot (*Maranta arundinacea*); it rarely appears in the European markets (Col. Rep. Misc. No. 71, 1910, p. 225).

The flower stems afford a white shining straw used for platting, Tahiti (Bot. Mag. l.c.); and there are specimens (under the names "Pia" or "Chou Chou") of plait for ladies' hats, from Switzerland and Paris in the Museum at Kew (Messrs. Paul Walser & Co. 1895 & 1898).

The fibre from India has been reported on for use as a braiding material, it is recommended that ribbons should not be less than 10–12 in. long; only used in a limited quantity (Col. Rep. Misc. No. 58, 1909, pp. 132–133). The petiole from which the fibre is obtained grows 1–3 ft. long.

The plant is a herbaceous perennial with a globose rootstock—"size of a large turnip" (Bot. Mag. l.c.) reaching 1 ft. diam. (Fl. Trop. Afr. l.c.); found in shady and somewhat moist places in bush, Zungeru (Dalziel, Herb. Kew), common in all soils from the river side to the tops of the hills (Barter, Herb. Kew) and found growing in a crevice on rock on top of hill near Budonga forest, Uganda (Dawe, Herb. Kew). The wild plant is described by Forster (*see* references under illust. and Bot. Mag. l.c.) as the most bitter and acrid of roots but rendered milder by cultivation.

Ref.—Fécule de Pia (*Tacca pinnatifida*) in Tahiti, Cuzent, pp. 172–175 (Rochefort, 1860).——"Sur Deux Plantes Alimentaires Coloniales peu connues (*Dioscorea bulbifera et Tacca involucrata*), Heckel & Schlagdenhauffen, in Bull. Soc. Nat. d'Accl. France (Revue des Sciences Natural Appliquées) 1er 1892, "Tubercles de *Tacca involucrata*, du Gabon et Soudan," pp. 373–383.——"*Tacca pinnatifida* die Stärkemehlreichste Knollenfrucht der Erde," Wohltmann, in Der Tropenpflanzer, ix. 1905, pp. 120–128.——"Tacca Arrowroot" in Bull. Imp. Inst. v. 1907, p. 238, from B.E. Africa.——"*Tacca pinnatifida*," in Col. Rep. Misc. No. 58, 1909, pp. 132–133, fibre from India.

DIOSCOREACEAE.

Dioscorea, Linn.

Dioscorea alata, *Linn.*; Fl. Trop. Afr. VII. p. 417.

Ill.—Burkill, Gardens Bull. Str. Sett. Aug. 31st 1915, pp. 299, 301 (tubers); Aug. 12th, 1918, tt. 1–4 (tubers); Sept. 12th,

1919, p. 159 (tuber); March 31st, 1917, tt. 1–6 (tubers—various races).

Vernac. names.—Doya (Hausa, *Dalziel*); Ube (Malaya, *Burkill*); Inhame de St. Thome (W. Africa, *Prain & Burkill*); Reuter Yam, Ben Yam (Tobago, *Broadway*); [Flour Yam, Bragging Tom, Silver, Two Sisters Hard, Cap, Pinguin, Duck, Oblong Hard, Snake, Pucka, Bullet Tree Hard, Red, Moonshine or Guinea Yam (Jamaica) *Harris*]; Baba-ou-le (Dominica, *Jones*); Water Yam (Tortola, Virgin Isles, *Fishlock*); Snake Yam (Trinidad, *Hart*); Barbados Yam (*Watt, Harris*); The Wing-stalked Yam, Greater Yam, White Yam, Water Yam, Ten Months Yam (*Burkill*), White Manila Yam.

Cultivated in Nupe (Barter, No. 1534, Herb. Kew), Aguku District, S. Nigeria (Thomas, Herb. Kew), West Tropical Africa and probably more or less throughout Tropical Africa, in the West Indies, India, Burma, Assam, Ceylon, Polynesia and Mascarene Islands (Kew Bull. 1912, p. 407).

It is the commonest of all the cultivated yams in India (Watt, Comm. Prod. India, p. 492) and of all species it is the yam most cultivated in Indo-Malaya (Burkill, l.c. Nov. 11th, 1918, p. 87), also commonly cultivated in the West Indies; but in Nigeria and West Africa it does not appear to be so common. This yam has very many races (l.c. Aug. 12th, 1918, pp. 37–44). The climbing stems are winged and the roots usually very large. Tubers are described by Watt (l.c.) as sometimes 4–8 ft. in length and as thick as the thigh, at other times small and globular like an average sized potato; several races are shown by Burkill (l.c.) to have similar variable characters and some of the " Water Yams " are stated by Barrett (Philippine Agric. Rev. 1912, p. 69) to weigh from 10–25 kg. A particularly large tuber of the " White Manila Yam " grown in Singapore, weighed 29 lb. after being nine months in the ground (Burkill, l.c. Sept. 12th, 1919, p. 158).

Ref.—" Some Notes on Philippine Yams," Burkill, in The Gardens Bull. Straits Settlements, i. Aug. 31st, 1915, *Dioscorea alata*, pp. 297–302.——" Different Parts of the Tubers of *Dioscorea alata* Sprout at Different Rates," l.c. pp. 306–307.——" A Report on Races of the Greater or Ten Months Yam, *Dioscorea alata*, Cultivated in the Botanic Gardens, Singapore," *Idem*, i. March 31st, 1917, pp. 371–396; pls. i. vi.——" A Report upon the Experimental Cultivation of the Greater Yam, *Dioscorea alata*, in 1917," *Idem*, l.c. ii. Aug. 12th, 1918, pp. 37–44, illustrated.——" A Progress Report on the Cultivation of the Greater Yam, *Dioscorea alata*," *Idem*, l.c. July 4th, 1919, pp. 129–135.

Dioscorea bulbifera, *Harms.*; Fl. Trop. Afr. VII. p. 415. (*D. sativa*, Linn. l.c. p. 415).

Ill.—Annals of Botany, London, xv. 1901, t. 26 (development of aerial tubers—*D. sativa*); Duthie, Field Crops, iii. t. 80 (*D. sativa*).

Vernac. names.—Doya, Doyar bisa, Tuwon biri (Hausa *Dalziel*); Ewuru-esi (Lagos, *Macgregor, Dawodu*); Acom (West Indies, *Prain & Burkill*); Acom (Jamaica, *Harris*); Akam (West Africa—S. Nigeria, &c. *Burkill*); Abana orfia (Aguku, S. Nigeria, *Thomas*).—Otaheite Potato, Danda Yam (Tobago, *Broadway*). Otaheite Potato—sent from Kew to Trinidad about 1894—is known in the West Indies as "Potato Yam" from the fact of its bearing large quantities of bulbils on the stem and in Grenada as "Cut and throw away" (Hart, Bull. Misc. Inf. Roy. Bot. Gdns. Trinidad, ii. 1896, p. 210).

Lagos (MacGregor, Dawodu, Herb. Kew); Oban (Talbot, Herb. Kew); Jeba—on the Kworra (Niger)—(Barter, Herb. Kew), etc. in Nigeria; Krebidje, Haut Oubangui (Chevalier, Herb. Kew) and throughout Tropical Africa; naturalised in the West Indies (Harris). The wild plant is common in India and Burma (Prain, Burkill, Watt) and across the Pacific, where also the cultivated forms are commonly grown; in Ceylon, Japan and Australia (Kew Bull. 1912, p. 407).

Rootstock variable, usually large under cultivation. In Jamaica the tubers of "Acom" are said to be rarely eaten, but a good starch is obtained from them (Harris, Bull. Dept. Agric. Jamaica, Jan. 1906, p. 5; Hart, l.c.). The underground tubers of the wild plant are stated to be insipid and often hardly edible, unless repeatedly boiled and washed in running water between each boiling; though in times of scarcity and famine they are in India an important article of food (Watt, Comm. Prod. India, p. 493). Fruits [bulbils] used for boils, fever, etc., Lagos (MacGregor & Dawodu, No. 145, Herb. Kew); bulbils edible, Mozambique (Johnson, No. 84, 1907, Herb. Kew); in Hausaland (Dalziel, Hausa Bot. Voc. p. 26—"Doyar bisa"); grown in Yola (Shaw, N. Nig. Gaz. Feb. 28th, 1910, p. 32—"Doyan bissa").

The climbing stems are not winged as in *D. alata*; but unlike this species aerial tubers are borne.

Ref.—"On the Origin, Development and Morphological Nature of the Aerial Tubers in *Dioscorea sativa*, Linn.," Dale, in Annals of Botany, xv. 1901, pp. 491–501.

Dioscorea cayenensis, *Lamk.* Encyl. iii. p. 233 (*D. prehensilis*, Benth., Fl. Trop. Afr. VII. p. 148, excl. *minutiflora*).

Ill.—Annals of Botany, London, xi. 1897, t. 15 (tuber-spinous roots—*D. prehensilis*); Chevalier, Bull. Soc. Bot. France, lix. 1912, p. 226, tt. 3 & 3 bis.

Vernac. names.—Kama (Unyoro, *Dawe*); Isu awun (S. Nigeria, *Foster*); Efuru, Esinminrin (S. Nigeria, *Burkill*). Negro Yam, Lucea Yam (Jamaica, *Harris*, specimen from Hope Bot. Dept. Herb. Kew), Guinea Yam, White Yam, White or Eight Months Guinea Yam (*Burkill*).

Nupe (Barter, No. 1536, Herb. Kew); Oban (Talbot, No. 723, 1911, Herb. Kew); Yola (Dalziel, No. 225, 1909, Herb. Kew); Abinsi & vicinity, N. Nigeria (Dalziel, No. 670, Herb. Kew); and S. Nigeria (Foster, No. 329, 1907, Herb. Kew); in Sierra

Leone, Ivory Coast, Togoland, Dahomey, Gaboon, Angola and probably throughout Tropical Africa and the West Indies.

Grown largely in former days as a food for Negro slaves (Kew Bull. 1919, p. 364); cultivated in Nupe (Barter, l.c.), the common cultivated yam in Munshi (Dalziel, l.c.). Of all the species of *Dioscorea* cultivated in Africa, *D. cayenensis*, Lamk. is certainly the one which takes first place; there are many varieties—of which fifteen have been verified on the Ivory Coast and a score in Dahomey (Chevalier, Bull. Soc. Bot. France, l.c. p. 225). In Unyoro the roots of " Kama " are eaten in times of great scarcity (Dawe, Herb. Kew).

On a specimen of roots received from West Tropical Africa (grown at Kew) in the Herbarium, it is stated that " this species has a large cluster of fleshy tubers like those of a *Dahlia*, which produce from various parts of their surface slender wiry roots armed with spines and at the base of the stem and top of the cluster of tubers a crowd of thick and very tough roots armed with strong spines form a dense matted thorny mass 2 ft. or more in diameter, arching over and completely covering the tubers, thus serving to protect them from being grubbed up by animals." This specimen was the subject of a paper by Dr. Scott in the Annals of Botany (*seq.*); it flowered at Kew in September 1894.

On the Cross River Expedition in 1899, the writer noted large stores of yams that were very probably *D. cayenensis*—this was especially so between Old Calabar and Uwet, at a village called Unan, where they were arranged in bin-like structures made of strong poles—one such being 120 ft. by 15 ft., carrying approximately 10,500 yams and ten more structures of about the same dimensions were in course of preparation.

Recently a large collection of herbarium specimens and tubers have been received at Kew from the Directors of Agriculture, Nigeria and Gold Coast, for determination in the course of the preparation of the monograph on the genus referred to (*seq.*). The results will be published in due course; but meantime they have so far been identified as being chiefly referable to this species and a few to *dumetorum* and *rotundata* (*q.v.*).

Ref.—" On two New Instances of Spinous Roots," Scott, in Annals of Botany: (1) *Dioscorea prehensilis*, Benth. xi. 1897, pp. 327–330.——" The Root-Structure of *Dioscorea prehensilis*," Hill & Freeman, l.c. xvii. 1903, pp. 413–423.——" Sur les *Dioscorea* cultivés en Afrique Tropicale et sur un cas de selection naturelle relatif à une espèce spontanée dans la forêt vierge," Chevalier, in Compt. Rendus, Acad. Sc. Paris, cxlix. 11th Oct. 1909, pp. 610–612.——" *Dioscorea cayenensis*, Lamk. (*D. prehensilis*, Hook.), Chevalier, in Bull. Soc. Bot. France, lix. 1912, pp. 223–227.——" The White or Eight Months Guinea Yam," Burkill, in the Gardens Bull. Str. Sett. ii. Nov. 11th, 1918, pp. 87–89.

Dioscorea dumetorum, *Pax*; Fl. Trop. Afr. VII. p. 419.

Ill.—Thonner, Blütenpfl. Afr. t. 21; Burkill, Gardens' Bull. Straits Sett. Nov. 11th, 1918, t. 8. (roots).

Vernac. names.—Kosain rogo, rogon biri (Hausa, *Dalziel*); Idiya (Chindao, Gazaland, *Swynnerton*); [Obabit Iwa, Ndisimo Iwa, Afia Edidia, Eba Edi (Old Calabar) *Burkill, Johnson*]. Nfamka or Nfamko (Gold Coast, *Burkill*); Esura (Lagos, *Burkill, MacGregor, Dawodu*). Ona (Aguku, S. Nigeria, *Thomas*).

Lagos, Old Calabar, Zungeru, Nupe and Yola, in Nigeria, also known from Uganda, Nyasaland, Gold Coast and Gazaland.

A poisonous yam, root as large as a man's fist, Aburi (Johnson, No. 482, Herb. Kew), frequently found growing wild with edible tubers, said to develop well with little care, Old Calabar (Johnson, Herb. Kew); "Nfamko" is stated to be edible, but medicinal on the Gold Coast; "Esura" has been eaten in Singapore without causing any discomfort, but it is slightly bitter (Burkill, l.c. p. 91); plant used (with others) in the preparation of Arrow poison, Manganja Hills, Nyasaland (Meller, Herb. Kew); spherical tubers eaten by the Natives only in time of famine and then only after special pounding and washing to expel poisonous juice, sometimes the cause of death (Swynnerton, Herb. Kew); "but with cultivated yams in West Africa, whose exact value has not yet been made clear," and "as *D. hirsuta* is a most important famine food of India and Malaya, so does *D. dumetorum* appear to be a famine food in Africa: but it appears to be more, for whereas *D. hirsuta* has given no cultivated races *D. dumetorum* has, and the conflicting statements of travellers as to its utility are to be explained in the light of this" (Burkill, l.c. p. 91).

When *D. dumetorum* sprouts, it throws up a stout prickly shoot, with alternate leaves and these leaves have the peculiarity that the base of the petiole is bent downwards to aid the plant in climbing (l.c.). In Gazaland it is reported to make very rapid growth after the annual jungle fires and grows straight upward till top-heavy, then falls and climbs over any vegetation on which it happens to rest (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 212; *D. quartiniana*).

Dioscorea rotundata, *Poir.* in Lamarck, Encycl. Suppl. iii. (1813) p. 139.

Tubers large, yellow-fleshed, with a thick neck and somewhat uneven surface: whole plant glabrous; stems climbing, young and old shoots prickly (Burkill); "strongly prickly to near the top of the vine" (Johnson); leaves cordate-orbicular, shortly acuminate, about 4 in. in diameter, 7-nerved, papery, dark green above, paler below; petiole slender, about 3 in. long "sometimes prickly" (Johnson). Male spikes 1–4 in the axil of each leaf; about 2½ in. long, about 40-flowered (Burkill).

Ill.—Burkill, Gardens, Bull. Straits Settl. Nov. 11th, 1918, p. 90 (leaves), t. 7 (roots).

Vernac. names.—[Alo Iganyan or Iganyan Alu (S. Nigeria); Akpana, Efiam (Old Calabar) *Burkill, Johnson.*] Affon or Affoo

(Jamaica, *Burkill*); Affon (Jamaica, Specimen from Hope Bot. Garden in Herb. Kew); Connie Yam (Tobago, *Broadway*); Yellow Yam (Trinidad, Jamaica, Grenada, Dominica, Antigua, *Hart*, No. 6097, 1896, Herb. Kew); Half-a-yam (Barbados, *Hart*); Yam a tout ans (Trinidad, *Hart*); Yellow or twelve months Guinea Yam (*Burkill*, l.c.); Igname à feuilles arrondies (*Poiret*, *Lamarck*).

Old Calabar (Johnson, July 1919, Herb. Kew); S. Provinces, Nigeria (Johnson, No. 7, 1915, Herb. Kew; Burkill, No. 314, 1916–17, Herb. Kew—cult. Singapore), Gold Coast and probably widely cultivated in West Africa and also cultivated in the West Indies.

The "Afon Yam" is described as having coarse, yellowish-white flesh and unless fully ripe the flavour is somewhat bitter; although extensively grown for use by the poorer classes it is not much used by the well-to-do in Trinidad, where the name indicates it as being somewhat of a favourite. Of all the varieties, it is the one which can be had most frequently in and out of season, in fact all the year round (Hart, Bull. Misc. Inf. Roy. Bot. Gdns. Trinidad, Oct. 1895, p. 209). The same is said of "Afon" in Jamaica, where it is said to thrive in hot districts and not so readily affected by unfavourable climatic conditions as the more delicate "white yams" (Harris, Bull. Bot. Dept. Agric. Jamaica, Jan. 1906, p. 4). The practice of harvesting the roots of this yam while the plants are kept growing appears to be the same in Trinidad and Jamaica (ll.cc.).

Exposure during growth of the tubers causes them to be bitter, and heavy damp soil is said to make the tubers clammy in texture when boiled and anything but palatable; but when grown in good open soil they are fairly dry and mealy (Harris, l.c.).

All cultivators seem to be agreed that this yam has a long vegetative period—up to 12 months. The average yield in grammes during four seasons of growth in Singapore of "Iganyan Alo," has been found to be 4904, 7544, 1819 and 5856 (Burkill, Gardens Bull. Str. Sett. Sept. 12th, 1919, p. 165) and the weight of tubers from the Department of Agriculture, Old Calabar, received at Kew in Feb. 1920 is given as 12 lb. 6 oz. ("Akpana") and 3 lb. 2 oz. ("Efiam"). It is reported that "Yellow Yams" do not keep well and though they may be prepared so that they may last a month, they are not favoured by exporters of yams (Journ. Jamaica Agric. Soc. March 1906; Agric. News, Barbados, April 28th, 1906, p. 140).

The African cultivated varieties of yam appear to be more or less uncertain as to their origin, but the common forms of *D. alata*, and *D. bulbifera*, are in the main the same as those of India, West Indies and in view of a name such as "Otaheite Potato" (*D. bulbifera* [sativa]) probably also of the Tropics of both hemispheres. There has not been any comprehensive survey of the whole series and though many authors have tackled "Yams"—invariably approaching the subject with admirable caution—it

appears to be still open to question as to how far each of them may be right. The main difficulty seems to be that of securing adequate materials for the determination of varieties, for as reported in Trinidad (Bull. Misc. Inf. Roy. Bot. Gdns. Oct. 1896, p. 206) "plants may well be grown for years without furnishing them and yet be at the same time sufficiently vigorous to ripen good crops of fine edible tubers; we have ourselves grown in these gardens an experimental patch for several seasons and as yet we have no certain material for the identification of may varieties." In India where at the Royal Botanic Gardens, Calcutta, the systematic study of growing plants made by Prain & Burkill, is more in advance of that in any other country (Prain, Bengal Plants, ii (1903), p. 1064; Watt, Comm. Prod. India (1908) p. 492) the final report is not yet made. This study is being extended to a monograph of the *Dioscoreas* from Africa, the West Indies and in general to the whole genus by Sir D. Prain and Mr. I. H. Burkill, for which purpose collections have been specially prepared at the request of the Director, by the Departments of Agriculture, Gold Coast (Tudhope, Ann. Rep. 1916, for 1915, p. 13) and Northern and Southern Provinces, Nigeria (Johnson, Ann. Rep. 1917, p. 7; letter to Director, dated Ibadan, 9th Dec. 1919); these have recently arrived at Kew and are now under examination.

The cultivation of yams is, in general, much the same—usually planted on mounds or ridges about 3–6 ft. apart, propagated by means of the bases of the stems, upper portions of the tubers, by aerial tubers, small underground tubers or portions of larger tubers. In Northern Nigeria they are planted from root eyes upon high mounds, topped with straw, with ditches dammed to retain the water between them; stakes are put in when plants have made a few feet of growth (Dudgeon, Agric. & For. Prod. W. Afr. p. 153). In Trinidad the upper parts of the yam are used, and when well ripened the tuber can be cut into pieces, everyone of which will make a plant—but in this case it is advisable to store them under finely sifted damp vegetable mould or coconut-fibre until they start growth (Bull. Misc. Inf. Roy. Bot. Gdn. Trinidad, 1896, p. 211); in the Philippines the basal or upper portion is customarily used and sections or chunks of the cylindrical rooted varieties weighing from 40–100 grams are regularly used in planting (Barrett, Philippine Agric. Rev. 1912, p. 69). In India it is preferable to use sets of the underground tuber weighing about half a pound (Watt, Comm. Prod. India, p. 496). If bulbils or aerial tubers are used they should be placed for the first year close together to form good plants or heads for the next season (Bull. Trinidad, l.c.); the first year's crop is poor, but the second excellent (Watt, l.c.).

A rich deep sandy loam, good drainage, average rainfall and thorough tillage are essential. Stakes may be bamboo or anything convenient to make a good support, they sometimes require to be 10–15 ft. high. Catch Crops—as "Coco Yam" (*Colocasia*

Antiquorum), " Ochro " (*Hibiscus esculentus*) Indian corn, etc., are commonly planted. The crop matures in from 6–12 months, according to variety, cultural and climatic conditions, and for similar reasons the yield may vary—an average crop may be from 4–5 tons per acre, per annum. From observations made at the Agricultural Station, Ibadan, S. Nigeria, the yield of some 30 different kinds varied from 3–20 tons per acre; the plants were 2 ft. apart on ridges 4 ft. apart (Johnson, Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1917, p. 7; 1918, p. 8). Four acres planted in Ilorin Province gave yields of 8,007 lb., 6,000 lb., 6,000 lb., and 5,400 lb. respectively, and the yams produced by 180 individual plants varied from 1–18 lb. per plant. The ground was planted (July 14th)—native fashion—with local native cotton between the rows. The yams were planted on May 12th and reaped the following January, 5, 6, 7, and 8th (Ann. Rep. Dept. Agric. N. Nigeria—Ilorin Province, 1914, p. 15). In this Province the yam crop is one of the most important for food, especially amongst the Yorubas and from Bode Sadu it is an important article for forwarding by rail to the South. It forms a great part of the food of the natives throughout the year; they commence digging the new yams about June, but the crop is not fully ripe until nearly the end of the rains (Thornton, Rep. Exp. Farm, Ilorin, Dept. Agric. N. Nigeria, 1917, p. 12). In Trinidad, " Barbados Lisbon," " Horn " and " Red " Yams, planted 2 ft. apart in trenches 3 ft. apart, at the end of May and beginning of June (1917) and reaped in the last two weeks of February 1918 gave, for the " Lisbon "—the most prolific yielder an estimated return of 18·47 tons per acre (Freeman, Agric. News, Barbados, 1918, p. 198).

From the dried yam, flour is made, used as food at all times of the year (Thornton, l.c.). Some investigation was made as to the possibility of shipping dried and sliced roots or flour from Nigeria. The flour was found to contain about twice as much protein and less fibre than average " Cassava " flour (*Manihot utilissima*) and that the composition agreed more closely with that of potato flour except that the percentage of protein was rather lower. It seemed doubtful on the whole whether yam roots or flour could be remuneratively exported under normal conditions (local prices, Jan. 1918, 12*l.*–15*l.* per ton) in competition with ordinary grades of potato starch " farina " (pre-war price in the United Kingdom, 9*l.*–13*l.* per ton).

There were 5 samples of flour examined in the course of the inquiry at the Imperial Institute, prepared specially from the varieties " Efuru," " Iyawo Olorun," " Odo," " Olonko " [all believed to be *Dioscorea cayenensis*] and " Apepe " (Johnson, l.c. pp. 8–11, *q.v.* for analyses of " Iyawo Olorun " and " Olonko ").

Ref.—" Sur deux Plantes Alimentaires Coloniales peu connues (*Dioscorea bubilfera* L. et *Tacca involucrata*), Heckel & Schlagdenhauffen, in Revue des Sciences Naturelles Appliquées, Paris, 1892; (1) " Histoire Naturelle du *Dioscorea bulbifera* (Plante, Bulbe

Aérien et Tubercle)," (2) "Analyse et Action Physiologique des bulbes Aériens Toxiques," pp. 268–280; (3) "Tubercles Souterrains de *D. bulbifera*," pp. 371–373.——"The Yam *Dioscorea alata* and other Species," in Tropical Agriculture, Nicholls, pp. 284–288 (Macmillan & Co., London, 1892).——"*Dioscorea bulbifera*," in Die Pflanzenwelt Ost Afrikas, Engler, Thiel, B, p. 134 (Berlin, 1895).——"Yams (*Dioscorea*) Bull. Misc. Inf. Roy. Bot. Gdns. Trinidad, ii. Oct. 1896, pp. 206–212.——"Yams (*Dioscorea*), in Ann. Rep. Roy. Bot. Gdns. Trinidad, for 1898, p. 13.——Yams in the West Indies, Fairchild, U.S. Dept. Agric. Div. of Botany, Circ. No. 21, 1899, pp. 1–4.——"*Dioscorea*," in Les Cult. Col. Pl. Alimentaires, Jumelle, pp. 33–44—*D. alata*, *D. bulbifera*, *D. cayenensis* (J. B. Baillière et Fils, Paris, 1901).——Recipes for cooking West Indian Yams, Pamphlet No. 18, 1902, pp. 1–7, issued by the Commissioner Imp. Dept. Agric. W. Indies.——"Jamaica Yam Cultivation," Fairchild, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 27, 1902, pp. 12–15.——"*Dioscorea*, Yam" in Economic Pl. Porto Rico (Contr. U.S. Nat. Herb. viii. pt. 2, 1903) pp. 134–135.——"*Dioscorea*" in Bengal Plants, Prain, ii. pp. 1064–1067 (Calcutta, 1903).——"Notes on *Dioscoreas*, Yams, Cultivated in the Royal Bot. Gdns. Peradeniya," MacMillan, in Trop. Agric. xxv. 1905, pp. 250–255.——"Yams," Harris, in Bull. Dept. Agric. Jamaica. Jan. 1906, pp. 3–6.——"*Dioscorea*," in Comm. Prod. India, Watt, pp. 492–497 (John Murray, London, 1908).——"*Dioscorea* ou Ignames,": Notes sur des Plantes largement Cultivées par les Indigènes en Afrique Tropicale," De Wildeman, in Ann. Mus. Col. Marseille, vii. 1909, pp. 303–312. ——Fécules de Dioscoreaceas: Etude de Quelques Fécules Coloniales," Planchon & Juillet, in Ann. Mus. Col. Marseille, vii. 1909, pp. 491–500.——"*Dioscorea*, Yams," in A Handbook of Tropical Gardening and Planting, MacMillan, pp. 195–196.——"Les Ignames du Nord-Ouest" [Madagascar], Jumelle, in Ann. Mus. Col. Marseille, viii. 1910, pp. 388–430, illustrated.——The Source of the Drug Dioscorea"; with a consideration of the Dioscoreae found in the United States, Bartlett, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 189, 1910, pp. 1–29 illust.——"Yams," Barrett, in Philippine Agric. Review, v. 1912, pp. 67–74, pls. i.–ii. roots."——"Les Ignames," de Noter, in l'Agric. prat. pays chauds, xiii. Jan. 1913, pp. 1–18; Feb. 1913, pp. 146–160; March, 1913, pp. 215–236.——"The Cultivation of Yams in Brazil," Torrend, in Broteria Vulg. Scientifica, xiii. part 6, Nov. 1915, pp. 287–293.——"Note sur la Culture Indigène de l'Igname," Thurin, in Bull. Agric. Congo Belge, vii. 1916, pp. 192–197.——"The Lesser Yam—*Dioscorea esculenta*," Burkill, in Gardens Bull. Straits Sett. i. March 31st, 1917, pp. 396–399; pls. vii.–ix.——"Yams," Johnson, in Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1918, pp. 8–11.——"*Dioscorea sativa*," Prain & Burkill, in Kew Bull. 1919, pp. 339–375.——"Some Cultivated Yams from Africa and Elsewhere," Burkill, Gardens Bull. Straits Sett. Nov. 11th, 1918, pp. 86–92, including "The White or Eight

Months' Guinea Yam," "The Yellow or Twelve Months' Guinea Yam," etc.——"Yields of the Lesser Yam and of some African Yams," *Idem*, l.c. Sept. 12th, 1919, pp. 159–165.

LILIACEAE.

SANSEVIERIA, Thunb.

Sansevieria metallica, *Ger. & Labr.* in Bull. Mus. Nat. Paris, 1903, pp. 170, 173; Kew Bull. 1915, p. 245. [*S. guineensis*, Baker, Fl. Trop. Afr. vii. p. 33.]

A perennial plant with a creeping rootstock. Leaves coriaceous, smooth, strap-shaped, 1½–5 ft. long. 2–5 in. broad, dark green, more or less banded or blotched with pale green. Inflorescence 1½–4 ft. high ending in a lax racemose head. Flowers in clusters 2–4 in each, white, with pedicels 2–3 in. long.

Ill.—Kew Bull. May 1887, p. 5, f. 1 (*S. guineensis*); Ann. Inst. Col. Marseille, 1902, t. 1 (*S. guineensis*); De Wildeman, Pl. Util. Congo, p. 625, f. 2; p. 629 (*S. guineensis*, section of leaf); Bull. Mus. Nat. Paris, 1903, p. 173, f. 2; Notizbl. Bot. Gart. Berlin, 7th Nov. 1909, App. xxii. No. 2, p. 52, f. 20 (*S. guineensis*); Engler, Pfl. Ost. Afr. C. t. 5, ff. A–F. (*S. guineensis*); Kew Bull. 1915, p. 246, f. 20 (var. *nyasica*).

Bowstring Hemp.

Native of Tropical Africa—Nupe? (Barter's No. 1508, from Nupe, Herb. Kew—"Common plant in hot rocky places; leaves often 4 or 5 ft. long," may belong here); cultivated in the tropical Botanic Gardens in the Empire, distributed from Kew.

This plant is regarded as being identical with that widely cultivated as *S. guineensis* (Kew Bull. l.c.). Yields a fibre suitable for cordage, *see* general information and references given below.

Sansevieria trifasciata, *Prain*, Bengal Pl. ii. (1903) p. 1054; Kew Bull. 1915, p. 239.

A perennial plant with a creeping rootstock and no stem. Leaves in groups of 1–2 or 2–6; 1–4 ft. long, 1–2¾ in. broad; coriaceous, linear-lanceolate or strap-shaped, narrowing towards the base into a channelled petiole, transversely banded with varying shades of green. Inflorescence 1–2½ ft. high. Flowers in clusters 3–8 in each, pale-greenish or greenish-white, with pedicels 2½–4 lin. long. A variety *Laurentii*, N.E. Br. is described as having leaves longitudinally striped with golden yellow, otherwise exactly as in the type.

Ill.—Jacq. Hort. Bot. Vindob. i. t. 84 (*Aletris guineensis*); Bull. Mus. Nat. Paris, 1903, p. 172, f. 1 (*S. guineensis*); De Wildeman, Pl. Util. Congo, p. 624, f. 1. (*S. guineensis*); Mission E. Laurent, p. clvi. (*S. guineensis*); p. 45, ff. 9–10 (*S. Laurentii*); Rev. Hort. Belge, 1904, p. 169 (*S. Laurentii*).

Bowstring Hemp.

West Africa—Oban, S. Nigeria (Talbot, Herb. Kew): Ogurude, S. Nigeria (Holland, No. 270, 1899, Herb. Kew) probably

also belongs here); Belgian Congo (var. *Laurentii*)—Stanleyville: Cultivated at Kew, Brussels Botanic Garden, Calcutta, in Assam, etc. This species is stated to have been in cultivation for over 150 years, confused for the greater part with *S. guineensis* (Kew Bull. l.c.); it is distinguished from *S. metallica*, Ger. & Labr. (*S. guineensis*, Baker) chiefly by the narrower leaves.

Yields a fibre suitable for cordage.

Fibre obtained from this species in Assam (Nazira) was described as well-prepared, white, glossy, with a staple of average length, 4½ ft.; reported on as "of first-class quality, superior to that usually seen on the London market, and would meet with a ready sale," value (1903), £50–£55 per ton in quantities of ten tons and upwards, small lots of lower value. Another valuation was £33 per ton. An analysis made at the Imperial Institute gave Moisture, 9·0 per cent.; Ash, 0·6; *a*–Hydrolysis (loss), 10·0; *b*–Hydrolysis (loss), 12·6; Mercerisation (loss), 8·1; Acid purification (loss), 2·3; Nitration (gain), 31·3; and Cellulose, 74·4 per cent. (Col. Rep. Misc. No. 58, 1909, p. 101). This analysis compared with that of a sample of fibre—3 ft.–3 ft. 4 in. long, from Sierra Leone (1902), and one with length of staple 3 ft. 3 in.–4 ft. 6 in. from the same Colony (1905)—both so-called *S. guineensis*—indicated that they were all very similar in chemical composition and behaviour, valuation (1906), of fair colour and of good length and strength, and if exported in fair quantity would sell freely at £33 per ton and upwards (l c., p. 87). The following may, perhaps, be correctly included here—"Ojakoko" fibre sent to the Imperial Institute by the Colonial Secretary of Lagos in 1906—"badly prepared fibre of very uneven length" (l.c. p. 89—*S. guineensis*); fibre from Southern Nigeria valued (1908) at £28–£30 per ton (Col. Rep. Ann. No. 601, 1909, p. 30) and a sample of "Aetiæni" fibre from Northern Nigeria—average length 3 ft. 3 in., "fine and weak," received in a twisted and plaited condition, worth (1911), if not twisted, £17–£18 per ton, with best Mexican Sisal at £25 per ton. Another—sample—only 18 in. long, also twisted, was considered to be too short to be of much commercial value (Col. Rep. Ann. No. 737, 1912, p. 27—*Sansevieria sp.*).

Sansevieria sp.

A plant about 3 ft. high. Rhizome, 1¾ in. thick. Leaves like those of *S. metallica*, but apparently thinner and more flaccid (specimens in Herb. Kew, No. 30470, 1909-10, Imperial Inst.).

Vernac. names.—Abala (Yoruba, specimen, l.c.), Modah? (Hausa, Dalziel, No. 231, 1909, Herb. Kew); Bessekoje? (Fufulde, N. Nigeria, *Dalziel*).

The specimens in the Kew Herbarium are from Northern Nigeria; but they are incomplete and do not admit of a proper determination of the species. Further specimens have been asked for by the Director, and it is hoped in due course to identify he plant. In the meantime, it is suggested that in all probability

it is one or other of the two species placed above, and the following information is quoted as found under the common names.

"Abala," fibre from Northern Nigeria, of fair quality and worth (Nov. 1909) £22–£23 per ton—pale straw-coloured, fairly lustrous, fine fibre, fairly well-cleaned on the whole; length of staple, 3 ft. 3 in.–4 ft.; average about 3 ft. 9 in.; corresponding botanical specimen identified at Kew (No. 30470)—*Sansevieria* sp. from the Forestry Officer at Lokoja (Dunstan, N. Nig. Gaz., May 31st, 1911, p. 101; Col. Rep. Ann. No. 656, 1910, p. 24); fibre from Sierra Leone, sample consisted of 4 lb. well-cleaned fibre which showed considerable variation in colour texture, length, and general appearance; the colour ranged from white to reddish-brown, and whilst some of the fibre was quite soft other portions were harsh; the length varied from about 1 ft.–6 ft., most of the fibres being 3 ft.–3 ft. 4 in. long; of good quality so far as chemical behaviour and composition are concerned although they lose more than the "Napunti" [*see Honckenya ficifolia*, p. 108 of this work] on hydrolysis and are not quite so rich in cellulose (Sierra Leone, Roy. Gaz., Feb. 9th, 1907, pp. 64, 65—also called here "Borfroko").

"Modah" or "Moda," a stemless plant with long straight mottled leaves affording a useful fibre, root, and leaf used medicinally (Dalziel, Hausa, Bot. Voc., p. 76); found in native compounds; but though sometimes used as a fibre its chief use is medicinal. Kontagora (Bull. Imp. Inst., 1907, p. 260); one of the "bowstring hemps," thrives well in a natural state in shady places, throughout the province of Yola and in the most northerly districts of the Protectorate, many hundred miles from the sea; although its fibre is used the plant is never cultivated (Dalziel, "Notes on the Yola Province," Kew Bull., 1910, p. 139).

Sansevieria fibre may be obtained from probably all the species—both flat-leaf and round-leaf forms—but East Africa appears to be the only source of the comparatively small trade in the product. It is sometimes classified with "African Sisal," usually under "African Hemp"; reports have shown "Sansevieria in trifling supply, likely to fall out of preparation—value, 17*s*.–17*s*. 6*d*." (Jan. 1912), "no imports—value, 21*s*.–22*s*." (Jan. 1913), "spot Sansevieria made 23*s*., tow, 13*s*.–15*s*. (July 1913), and "Sansevieria offers at 45*s*." (Mon. Circs. Ide of Christie, 15th Aug. 1919 and above dates), all per cwt. "Bowstring Hemp" is a name stated to have been proposed by Dr. Roxburgh, because the natives of the Circars (India) make their best bowstrings of the fibres of *Sansevieria*, and samples of this fibre which have appeared in the London market from Africa have been called "African Bowstring Hemp" (Kew Bull., May 1887, p. 1). The plant (*S. Ehrenbergii*) indigenous to Somaliland is called "Aloe," a name applied to *Furcraea gigantea* in Natal; popularly to *Agave americana* ("American Aloe"); but properly it is a generic name. The fibres are all

more or less suitable for the same purposes as "Sisal" (*Agave sisalana*) and "Mauritius Hemp" (*Furcraea gigantea*); but the cultivation does not seem to have gathered the importance of either. The cultural and climatic requirements are approximately the same, excepting perhaps, the plant under consideration is easier, if anything, to propagate—from seed, division of the root-stocks and by leaves or pieces of leaves, that planting may be done more closely, about 3 ft. by 3 ft. for moist, shady situations, and that the plants once established would spread and cover the ground after the manner of "Ramie" (*Bohemeria nivea*). It is remarkable that in the propagation of *S. trifasciata*, var. *Laurentii*, the variegation or yellow-striping in the leaves is not reproduced from leaf cuttings—but division of the root-stock does reproduce the variegated plant (Kew Bull., 1915, p. 240)

The extraction of the fibre is effected on much the same lines as for the hemps above-mentioned, being more particularly applicable to the flat or strap-shaped leaves, like those of the species described above. There appears to be little satisfactory information as to yield. In an experimental trial in Jamaica, 1185 lb. of green leaves of *S. guineensis* (so-called), cleaned by machinery, yielded 29 lb. 10 oz. of dry fibre (Kew Bull., May 1887, p. 6), and under favourable conditions the return is estimated at 1½ tons of dry fibre per acre (Morris, Journ. Soc. Arts, xliii. 1895, p. 915).

Ref.—"On the *Sansevieria guineensis* or African Hemp," Daniell, in Pharm. Journ. xii., 1852, pp. 130–132.——"Bowstring Hemp," Kew Bull., May 1887, pp. 1–11.——"*Sansevieria* Fibre from Bechuanaland (*S. sulcata*)," l.c. 1889, pp. 22–224.——"Sansevieria Fibre from Somaliland (*S. Ehrenbergii*)," l.c. 1892, pp. 129–132 and in Kew Bull. Add. Series II. "Veg. Fibres," pp. 114–130.——Report on the Aloe Fibre Industry of Somaliland Diplomatic and Consular Report, Misc. No. 225, 1892, Egypt, pp. 1–3.——"Bowstring Hemps," in Commercial Fibres, Morris, in Journ. Soc. Arts, xliii., 1895, pp. 915–916.——"Les Sansevieria Africains," in Pl. Utile du Congo, De Wildeman, Art. xxxv., pp. 617–652 (Brussels, 1903).——"Sansevieria Fibres from British East Africa," in Bull. Imp. Inst., iv., 1906, pp. 189–198.——"Sansevieria"—various species in Col. Rep. Misc. No. 58, 1909—Sudan, pp. 58–60; Somaliland, pp. 60–61; East Africa Protectorate, pp. 65–74; Nyasaland, p. 78; Rhodesia, p. 81; Transvaal, p. 82; West Africa, pp. 86–89; Assam—*S. trifasciata*, pp. 101–102; Straits Settlements, pp. 103–104; and S. Australia, p. 105.——"Les Sansevières, Culture et Exploitation," Michotte, in L'Agric. prat. pays chauds, xiii., May 1913, pp. 356–375; June 1913, pp. 455–474.——"Sansevieria," Brown in Kew Bull., 1915, pp. 185–261, illustrated.——"Bowstring Hemp (*Sansevieria spp.*)" in Cotton and Other Vegetable Fibres, Goulding, pp. 185–187 (John Murray, London, 1917).——"Sansevieria Fibres"—from the Belgian Congo, in Bull. Imp. Inst., xv., 1917, pp. 488–490.

Smilax, Linn.

Smilax Kraussiana, *Meisn.*, ; Fl. Trop. Afr. VII. p. 424.
Ill.—Trans. Linn. Soc. xxix. 1875, t. 106; Wood, Natal Pl. iv. t. 339.

Vernac. names.—Kwaranga (Hausa, *Dalziel*); Jiabana mwo (Aguku, S. Nigeria, *Thomas*); M'Kolola (Madi, *Grant*); Wachten-Betje (Natal, *Wood*); Ingwena Ngulube (Gazaland, *Swynnerton*).

Lagos, River Nun, Oban, Sokoto in Nigeria, also on Senegambia, Cameroons, Gaboon, Lower Congo, Mozambique, and Natal.

Roots used medicinally by the Wanyamezi in the Madi region (Grant, Trans. Linn. Soc. xxix. 1875, p. 162).

A climbing shrub, up to 15 ft. or 20 ft. with prickly stems; twiner, 20 ft. River Nun (Barter, Herb. Kew); a common thorny trailer found wherever the soil is rich and the grass growth rank, Southern Melsetter district (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 212).

Dracaena, Linn.

Dracaena cylindrica, *Hook, f.*; Fl. Trop. Afr. VII. p. 448.
Ill.—Bot. Mag. t. 5846.

Old Calabar, Oban, in S. Nigeria.

An ornamental plant with a slender stem 10–12 ft. high; introduced from Old Calabar to the Royal Botanic Garden, Edinburgh, from whence it was sent to Kew in 1870 (Bot. Mag. l.c.).

Dracaena elegans, *Hua*; Fl. Trop. Afr. VII. p. 446.
Ill.—Dombrain, Floral Mag. iv. 1872, t. 16.
Vernac. name.—Ewanmermi (Benin, *Farquhar*).

S. Nigeria (Farquhar, No. 13, 1911, probably belongs here; but the specimen consists of only one leaf and flowering branch), and French Congo.

An erect shrub with slender branches, ornamental.

Dracaena Godseffiana, *Hort.* Sander; Fl. Trop. Afr. VII. p. 444.
Ill.—Garden, ii. Oct. 3rd, 1896, p. 276; Bot. Mag. t. 7584.

Lagos.

A handsome decorative plant, first sent to Kew in 1892 by the Curator (H. Millen), Lagos; subsequently imported by Messrs. Sander, St. Albans, and now commonly grown in gardens of this country.

Dracaena Goldieana, *Bull.*; Fl. Trop. Afr. VII. p. 449.
Ill.—Gard. Chron. Oct. 20th, 1877, p. 486; Fl. and Pom. Nov. 1877, p. 246; Bull. Cat. 1877, t. 8; Ill. Hort. 1878, t. 300; Rev. Hort. 1878, p. 15; Gard. Chron. Jan. 14th, 1882, p. 49, f.6; Bot. Mag. t. 6630; Nicholson, Dict. Gard. i. p. 490, f. 681; Ill. Hort. xlii. 1895, p. 257, f. 36; Bailey, Cycl. Hort. ii. t. 37.

Old Calabar (Goldie): Uwet (Holland, No. 195, 1899, Herb. Kew).

A handsome decorative plant, a foot or so high, suitable for pot culture; introduced to Botanic Garden, Edinburgh, in 1870, by the Rev. Hugh Goldie, United Presbyterian Mission, Old Calabar, and first propagated for trade purposes by Mr. Bull of Chelsea. The Gardener's Chronicle Oct. 20th, 1877, advertised plants for sale at 7 and 10 guineas each, at the same time stating that "the 5 guinea size announced last week have all been sold." Plants may now be bought for a few shillings. Flowered at Marseilles (1881) in the gardens of Dr. Renouard (Gard. Chron. Jan. 14th, 1882, p. 48) on which A. F. Marion, wrote in reference to the proterogynous flowers—" Note sur la floraison du *Dracaena Goldieana*, observée dans les serres de M. G. Renouard (Marseille, 1881).

Dracaena Mannii, *Baker*; Fl. Trop. Afr. VII. p. 438.

Vernac. names.—Ope Kankana, Osun Buke (W. Prov. S. Nigeria, Prov. Forestry Officer, No. 3, 1909, Herb. Kew); Ope Kanakana (S. Nigeria, *Dennett*); Afoliafo akwo akuko (Agolo, S. Nigeria, *Thomas*); Ningei (Mendi, Sierra Leone, *Lane-Poole*). "Asparagus Bush" (Sierra Leone, *Lane-Poole*).

Old Calabar River and in Western Province, S. Nigeria, also in Sierra Leone and Gold Coast.

Gives a scanty and light coloured dye used by the Natives in the Western Province, S. Nigeria (Imp. Inst. l.c.). Young shoots eaten as Asparagus by Natives and Europeans, and the Natives chop the leaves up very fine and cook them mixed with rice, Sierra Leone (Lane-Poole, Trees, Shrubs, &c., Sierra Leone, p. 34, Herb. Kew).

Trunk woody, 30 ft. long (Fl. Trop. Afr. l.c.) up to 25 ft. Sierra Leone (Lane-Poole, l.c.); 70 ft. Akwapim, Gold Coast (Johnson, No. 687, 1900, Herb. Kew).

Dracaena phrynioides, *Hook.*; Fl. Trop. Afr. VII. p. 447.

Ill.—Bot. Mag. t. 5352.

Lagos, Yoruba, Fernando Po. Introduced to cultivation in this country 1860 (l.c.).

Stem very short and leaves in a rosette.

Dracaena surculosa, *Lindl.*; Fl. Trop. Afr. VII. p. 443.

Ill.—Bot. Reg. (1828) t. 1169; Bot. Mag. t. 5662 (var. *maculata*).

Old Calabar River (Mann, No. 2327, Herb. Kew), Oban (Talbot, No. 146, Herb. Kew), also in Sierra Leone, Gold Coast, &c.

A much branched shrub, 6–10 ft. high—3–4 ft. in home gardens. A handsome decorative plant. Sent from Sierra Leone by G. Don in 1821 to the Horticultural Society, in whose gardens at Chiswick the drawing for the Botanical Register was made in July 1827 (Bot. Reg. l.c.). Unlike other species of *Dracaena* it produces suckers—hence the specific name.

Pleomele, Salisb.

Pleomele fragrans, *N. E. Br.*; Fl. Trop. Afr. VII. p. 440 [*Dracaena fragrans*, Gawl.]; Kew Bull. 1915, p. 259.

Ill.—Jacq. Fragm. Bot. t. 2, f. 6; t. 33, f. 1 (*Sansevieria fragrans*); Bot. Mag. t. 1081 (*Dracaena fragrans*); Andr. Rep. t. 306 (*Aletris fragrans*); Redouté, Choix Fl. ii. t. 117 (*Aletris fragrans*); Gard. Chron. Aug. 31st, 1901, p. 168 (*Dracaena fragrans*, var. *Lindeni*); Ill. Hort. xxvii. 1880 t. 384 (*D. Lindenii*). xxviii. 1881, p. 57 (*D. Lindeni*; Bailey, Cycl. Hort. ii. f. 1345 (*D. fragrans*, var. *Lindenii*).

Oban (Talbot, No. 1412, 1912) in Southern Nigeria; and found in Sierra Leone (Afzelius) and in Chirinda Forest, Gazaland (Swynnerton, Herb. Kew).

Leaves eaten by rock-rabbits or conies (*Hyrax*) Gazaland (l.c.).

Trunk arborescent, up to 20 ft. or more in height; 30 ft. or so in height, stems up to a foot or more in diam. Mt. Maruma, alt. 3000 ft. or a shrub about 10 ft. in height, forming dense handsome clumps here and there throughout the forest (Chirinda) and a favourite nesting place for forest birds, Gazaland (Swynnerton, Herb. Kew and in Journ. Linn. Soc. xl. 1911, p. 214).

A decorative plant. Cultivated by Miller at Chelsea Physic Garden in 1768 (Bot. Mag. l.c.); grown to fence in enclosures, French Guinea and Ivory Coast (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 343—*Dracaena fragrans*).

Dracaenas—including *Pleomele* etc., are easily propagated by pieces of old stem, 1 or 2 ins. long, planted near the surface in light, rich soil, or the young tops may be put in as cuttings and seeds may be sometimes available of arborescent species.

Aloe, Linn.

Aloe Barteri, *Baker*; Fl. Trop. Afr. VII. p. 464.

Vernac names.—[Zabo, Zabon dafi or Zaboko (Sokoto); Kabargiwa (Kano, Zaria) Hausa, *Dalziel*.]

Nupe (Barter, No. 1502, Herb. Kew); Lagos (Millen, No. 172, Herb. Kew); Abinsi and vicinity (Dalziel, No. 853; comm. Imp. Inst. May 1913—this specimen is incomplete; but it is more than likely to be this species, Dalziel translates the Hausa name "Zabo" as "guinea fowl"—from the white speckling of the leaves, a description aptly fitting the leaf, which is pale-green with white spots); Yola (Shaw, No. 63, 1909, Herb. Kew) may also belong here—"5 ft. high and flowers red") and in Bangui, Territoire du Haut-Oubangui (Chevalier, No. 5245, 1902, Herb. Kew).

Much planted for medical use, Lagos (Millen, l.c.); used as an ingredient of arrow poison, N. Nigeria (Dalziel, Hausa Bot. Voc. p. 106). "Aloes" of commerce is chiefly obtained from *Aloe vera*, Lam. of N. Africa, cultivated in Jamaica, Barbados, &c., various species of *Aloe—spicata*, *ferox*, *africana*, and

plicatilis which yield "Cape" or "S. African Aloes" and *Aloe Perryi*, Baker, "Socotrine Aloes."

Plant 3 ft. or more high, in sandy soil, Nupe (Barter, l.c.). A bush plant with orange yellow flowers and a cultivated plant ("Zabon dafi") having bright red flowers, grown near houses, have been noted in Sokoto (Dalziel l.c.). Sometimes planted in villages or on tombs of the Kissi (French Guinea) among the Sombas (Haut-Dahomey) and in Upper-Oubangui (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 343). Introduced into cultivation at Kew in 1892.

ALLIUM, Linn.

Allium ascalonicum, *Linn.* Amoen. Acad. iv. (1759) p. 454.

A bulbous perennial, well known in gardens everywhere.

Vernac. names.—Busl or Buol (Hadramaut, *Lunt*); Sabulah (Accra, *Easmon*); Ango (Fanti, *Easmon*).—Shallot, Eschalot.

Native of Palestine: widely cultivated in tropical, sub-tropical and temperate countries.

Grown to a large extent in localities where manure is scarce, N. Nigeria (Dudgeon, Agric. & For. Prod. W. Afr. p. 154); in N. Nigeria, Nigerian Soudan, Dahomey, Ivory Coast, Senegal, etc. (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 344).

Propagated by bulbs, the strongest and best being usually selected; planted in well-prepared beds, moderately well manured, at distances of about 12 in. by 8 in., just deep enough for the crown to be at or near the surface. They are ready for gathering when the tops begin to fall, in or about 6 months.

Allium Cepa, *Linn.* Sp. Pl. (1753) p. 300.

An annual plant, with a bulb varying in size from that of the shallot to about 3–4 in. in diam., according to variety.

Vernac names.—Albassa (Hausa, *Dudgeon*); [Albasa, Guda (Kano), Gudagi (Sokoto), shafa—spring onion (Kano); safa—spring onion (Sokoto) Hausa, *Dalziel*].—Onion.

Widely cultivated in tropical, sub-tropical and temperate countries.

The principal commercial sources of onions are Spain, Egypt, Canary Islands, Bermuda, Holland, France, Belgium, Germany, Portugal, Malta & Gozo, 9,105,164 bushels being imported in 1913, Spain contributing over 5,000,000 and Egypt nearly 3,000,000 bushels, and there is also a large trade in home-grown produce (Kew Bull. 1919, p. 76).

In view of such imposing figures it would, perhaps, be idle to recommend or attempt export to this country from Nigeria, but there may be ample scope for development in the cultivation—already of considerable importance in the Northern Provinces—for local consumption and for supply to the markets near the coast. The onion cultivated largely throughout Northern Nigeria, especially in Kano, is a red variety (Dudgeon, Agric. & For.

Prod. W. Afr. p. 154; Dunstan, N. Nig. Gaz. 28th Feb. 1910, p. 29). "Red" and "White" onions are grown in the Canary Islands, and the same in Bermuda (Kew Bull. Oct. 1887, p. 3). The "Red Bermuda" is regarded as synonymous with "Giant Red Italian Tripoli" and "Mammoth Red Tripoli," and "White Bermuda" as synonymous with "Canary Island" white (Tracy, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 21, 1903, pp. 257, 260). The red and white varieties of the Canary Islands are stated not to be permanent, but pass into one another under altered conditions of the soil, etc. The white variety is chiefly grown in the Island of Palma and on the south side of Teneriffe; those grown in Teneriffe gradually lose their character, becoming reddish in colour, and after three years' cultivation are indistinguishable from the red variety; but those grown in the island of Palma maintain their character unchanged, and the seed for export is obtained from this island, largely exported to the Bermudas (Kew Bull. Oct. 1887, p. 3). About 40,000 lb. of onion seed were shipped from the Canaries to the United States in 1915 (Gard. Chron. May 6th, 1916, p. 247) and 63,014 lb. in 1920 (commerce Rep. *seq.*). The type of onion usually grown in the West Indies is either the red or white Bermuda, stated to have proved well suited to local conditions, and efforts to grow other varieties have not been very successful (Jackson, Pamph. No. 78, 1915, Imp. Dept. Agric. W. Indies, p. 8). The "Bermuda Onion from Teneriffe" is recommended for cultivation on a commercial scale in Cuba, where nearly all classes of American Onions are stated to have been tried with no success (Austin & Halstead, *seq.* p. 30). Of the many varieties under cultivation—there are 399 varieties enumerated by Tracy, U.S. Dept. of Agriculture (l.c. pp. 246–263)—it would seem that the Canary Islands variety is the best for hot countries, and in all probability that grown in Nigeria is the same. It would, however, be advisable to raise stock from Canary Island seed. The Nupe people of Lemu (Bida) do not preserve the seed from their own plants, but purchase it yearly from Hausa traders, who bring it from the North (Dudgeon, N. Nig. Gaz. 31st July 1909, p. 158). Seed ripened in sub-tropical or temperate countries is of a more vigorous character than that grown in the Tropics. The "White Egyptian Onion" has also been recommended for cultivation—with the chance of a good introduction to the London trade if they could arrive in February or March before the supplies from Egypt come in from the end of March to the end of May (Dunstan, N. Nig. Gaz. 28th Feb. 1910, p. 29). Red onions from Kano have been reported on by London salesmen, with little or no favour—"red colour a disadvantage," "white onions preferred," "too soft to be transported such a long distance, and that their value in the London market—on the average 4*s.* per cwt.—at whatever season they arrived would not be sufficient to encourage shipments" (l.c.). Onions weighing $\frac{1}{2}$–$\frac{3}{4}$ lb. are sold at Kano at $\frac{1}{2}$*d.* each (50 cowries), smaller ones to the north of Ilorin at 1*d.* each, to the south of Ilorin at Ibadan, at 3*d.* each,

and at Lemu north of Bida, the price of medium onions, about six to the pound, is $1\frac{1}{2}d.$ per lb. (Dudgeon, N. Nig. Gaz. 31st July 1909, p. 157).

The cultivation requires skill and constant care; but it appears to be well understood in Nigeria. At Lemu, where the cultivation is of some importance, "the seed is sown closely in beds of soil enriched with manure and covered over with straw; when the young plants are a few inches in height they are transplanted into other beds and cow and goat manure is strewn over the surface. The whole cultivation is done during the dry season and the plants are watered daily from calabashes. In the Kano and Zaria districts, a similar method of cultivation is employed, but the beds are usually more extensive and the watering is done by means of the 'shadoof' as well as the calabash" (l.c. p. 158). In the Canary Islands the seed is sown broadcast in beds in October, seedlings transplanted in December into new beds, the leaves being shortened by 1 or 2 in. at the time; set out in rows about 8 in. apart. The harvesting commences about the 10th of April and continues through the latter part of this month and May. The white variety comes into the market a little earlier than the red and hence commands a better price. When gathered the onions are left lying on the land for 3 or 4 days to dry in the sun; they are then strung into ropes and so prepared for sale. The soil is very light and the ploughing very shallow; but naturally well-drained; manured with farm-yard manure, Peruvian guano or Cactus guano, irrigated, and the strain is preserved by alternating with Indian Corn or Potatoes, or by planting the onions in newly cleared ground every other year. Seed is obtained from bulbs replanted 12–14 in. apart in November, the top of each bulb being first sliced to induce the growth of several heads (sometimes 10), which ripen during the end of June and first half of July. The heads are picked as they mature, spread on sheets and dried in the sun, and the seed separated by rubbing with the hand. About 1 lb. of seed is produced from every 20 onions; but the red seed is slightly heavier than the white (Kew Bull. Oct. 1887, pp. 3, 4).

Ref.—"Onion Disease at Bermuda (*Peronospora Schleideniana*)," in Kew Bull. Oct. 1887, pp. 1–23, including "Report by Mr. Arthur Shipley on the Onion Crop in the Canary Islands."——"*Allium Cepa*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 169–171.——"Cultivating Onions in Egypt," in Journ. Bd. Agric. March, 1895, pp. 333–335.——"The Onion and Its Cultivation," Glenny, in Journ. Roy. Agric. Soc. vi. 1895, pp. 257–275——Occurrence of Quercetin in the Outer Skins of the Bulb of the Onion, *Allium Cepa*, Perkin & Hummel, pp. 1295–1298 (From Trans. Chem. Soc. London, 1896).——Onion Culture, Watts, U.S. Dept. Agric. Farmers' Bull. No. 39, 1896, pp. 1–30.——"The Brined Onion Industry," in Journ. Bd. Agric. Dec. 1902, pp. 349–354.——"Onion Cultivation," Agric. News, Barbados, ii. Sept. 12th, 1903, pp. 294–295; iii. Sept. 10th, 1904, pp. 289–290.

——"Onions, Garlic, Leeks and Shallots," in "Vegetable Growing in Cuba," Austin & Halstead, Estaciòn Central Agronómica de Cuba, Bull. No. 13, June 1908, pp. 30–33. ——Onion Culture, Beattie, U.S. Dept. Agric., Farmers' Bull. No. 354, 1909, pp. 1–36, illustrated.——"Onion Growing," Mundy, Rhodesia Agric. Journ. viii. Dec. 1910, pp. 254–261. ——"Onion Thrips," Jack, l.c. pp. 262–266.——"Report on Onions from Northern Nigeria," Dunstan, in N. Nigeria Gaz. Feb. 28th, 1910, p. 29.——"Onions" (Extract from Report on the Sub-District of Dan Isa, Kano Province), Gepp, in N. Nigeria Gaz. April 29th, 1911, Suppl. p. viii. (95).——The Home Production of Onion Seed and Sets, Beattie, U.S. Dept. Agric., Farmers' Bull. No. 434, 1911, pp. 1–24, illustrated.——"Cultivation of Onions," Journ. Bd. Agric. Nov. 1911, pp. 638–642.—— Onion Cultivation, Jackson, Pamphlet No. 78, 1915, Imp. Dept. Agric. W. Indies, pp. 1–30.——"Is Onion Growing Worth While?" Newton, in Journ. Bd. Agric. March, 1918, pp. 1378–1384.——"Onion Seed in the Canary Islands," Henry, Commerce Report, Washington, Jan. 5th, 1921, pp. 54–56.

Allium sativum, *Linn.* Sp. Pl. (1753), p. 296.

A bulbous perennial a foot or so in height. Leaves narrow, flat. Flowers white or purple; umbel bulbiferous.

Vernac. names.—Tafarnuwa (Sokoto, *Dalziel*); Thome (Hadramaut, *Lunt*).—Garlic.

Sokoto (Dalziel, No. 527, 1911, Herb. Kew); Mediterranean region, and in many temperate countries.

Used in some countries as a food, as well as for flavouring, like the onion; in England more as a seasoning agent in cookery, largely so in Italy. Cultivated as a pot-herb in many parts of the Soudan region, in French Guinea, the Nigerian Soudan, especially in the valley of the Middle Niger and in Northern Nigeria (Chevalier, Bull. Soc. Nat. d'Accl. 1912, p. 343), but in Nigeria said only to be used as a medicine commonly for fevers and stomach complaints (Dalziel, Hausa Bot. Voc. p. 90). It is of greater importance in medicine, preparations are recommended for treatment of tuberculosis (Year Book, Pharm. 1912, p. 214); in intermittent fevers it is a highly esteemed Hindoo remedy and was formerly used in similar cases in this country and elsewhere (Bentl. & Trimen, Med. Pl. *seq.*); but officially for medicinal purposes appears to have fallen into disuse.

May be propagated by seed and also the bulb divides into "Cloves," which may be planted like the bulbs of the "shallot" and cultivated in the same way, in a light dry soil.

Ref.—"*Allium sativum*," in Med. Pl. Bentley & Trimen, No. 280, pp. 5.——"*Allium sativum*," in Pharmacographia Indica; Dymock, Warden & Hooper, iii. pp. 488–491 (Trubner & Co., Ltd., London, 1893).——"*Allium sativum*," in Field Crops, Duthie & Fuller, iii. pp. 34–35.

URGINEA, Steinh.

Urginea altissima, *Baker*; Fl. Trop. Afr. VII. p. 538.

Ill.—Jacq. Hort. Schoenbr. i. t. 87 (*Ornithogalum giganteum*); Bot. Mag. t. 1074 (*Drimia altissima*); De Wildeman, Mission E. Laurent, t. 85.

Vernac. name.—Magerman (Zwartland, S. Africa, *Pappe*).

Nupe (Barter, No. 3432, Herb. Kew), and in Sierra Leone, Loango, Nyasaland and South Africa.

One of the plants of which the bulbs are used in place of the officinal "squill" (*U. maritima*, Baker); but which owing to the abundance and low price of the latter never appear in the European market (Flückiger & Hanbury, Pharmacog. p. 693); resembles *maritima* in its effects and may be prescribed as a substitute (Pappe, Fl. Cap. Med. Prod. p. 41).

Bulb globose, 4–6 in. in diam. outer tunics brown, common beween Ilorin and the Niger, spike often 7 or 8 ft. high, flowers white (Barter, l.c.).

Urginea indica, *Kunth*; Fl. Trop. Afr. VII. p. 540.

Ill.—Wight, Ic. Pl. Ind. Or. t. 2063.

Vernac. names.—[Básal-el-Unsal, Basel-el-far (Arabia), Pizát-i-dashti (Persia) *Dymock, Warden & Hooper*].—*See* Onion, Rats' Onion and Wild Onion (being a translation of the Arabic and Persian names), Indian Squill.

Nupe (Barter, No. 1099, Herb. Kew) and in Senegambia, Sierra Leone, Eritrea, British East Africa and India.

Bulb used for similar purposes to that of the officinal "squill" (*see* above); though said to be a poor substitute (Mooden Sheriff, Suppl. to Pharm. Indica, Madras, 1869, p. 250), having little or no action when it is old and large (Flückiger & Hanbury, l.c.); though also said to be as useful as the officinal squill (Watt, Dict. Econ. Prod. India). The Hindus use the bulb in the preparation of "Chaudi-bhasma" or "ashes of silver," used medicinally. The officinal squill (*U. maritima*) is dried and imported into England from Malta.

Bulb globose, 2–3 in. in diam., flowers dull green (Barter, l.c.), found in sandy soil, especially near the sea throughout India (Watt, l.c.).

Ref.—"Bulbus Scillae," in Pharmacographia, Flückiger & Hanbury, pp. 690–693.——"*Urginea Scilla*,—Squill," in Med. Pl. Bentley & Trimen, No. 281, pages 5.——"*Urginea indica*," in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 476–479.——"*Urginea indica*," in Dict. Econ. Prod. India, vi. pt. 4, 1893, pp. 213–214.

GLORIOSA, Linn.

Gloriosa superba, *Linn.*; Fl. Trop. Afr. VII. p. 563.

Ill.—Herman, Hort. Lugdui Batavorum, t. 689 (*Metonica malabarorum*); Plukenet. Phyt. i. t. 116, f. 3 (*Metonica malabarorum*); Commelin, Hort. Med. Amstel. Pl. i. t. 35 (*Lilium

zeylanicum superbum); Rheede, Hort. Mal. vii. t. 57 (" Mendoni "); Gaertner, Fruct. Sem. Pl. i. t. 18; Lam. Encycl. t. 247; Schneevoogt, Ic. Pl. Rariorum, t. 35; Darwin, Bot. Gdn. ii. p. 14; Andr. Rep. ii. t. 129; Bot. Reg. (1815), t. 77; Redoute, Choix, Fl. i. t. 26 (*Methonica superba*); Savi. Fl. Ital. iii. t. 86; Drapiez. Herb. Amat. de Fleurs. i. t. 7 (Glorieuse du Malabar); Geel, Sert. Bot. iii.; Rchb. Exot. i. t. 51; Wight, Ic. Pl. Ind. Or. t. 2047; Journ. Bombay, N.H. Soc. vii. 1892, t. F. p. 489; Garden, xxxviii. Dec. 20th, 1890, p. 576; Rev. Hort. Belge, 1897, p. 121; Le Jardin, 1916, p. 85, f. 26.

Vernac names.—[Bauraira, Gatarin Kureje (Sokoto), Gudumar Zomo (Kano) Hausa, *Dalziel*]; Olodi (Aguku, S. Nigeria, *Thomas*); Marâthi (India, *Kirtikar*).

Old Calabar, Nupe, Zungeru, and throughout Nigeria; also in the Cameroons, Gambia, Congo, Togoland, Nyasaland and in Tropical Asia; Leeward Islands, West Indies (Kew Bull. 1891, p. 114).

The tuber is poisonous, stated to contain two resins, a tannin and a bitter principle called " superbine "—allied to the bitter principle of " Squill " (*Urginea maritima*), not infrequently employed for suicidal purposes (Green & Tutin, Pharm. Journ. xl. 1915, p. 746); one of the 9 secondary poisons mentioned by Hindu writers; very few cases of poisoning are on record, but the plant is well known all over the country (India) as a virulent poison, although it is said to be useful in fevers as an antiperiodic (Kirtikar, Journ. Bombay N.H. Soc. vii. p. 492).

The plant is well known for its ornamental character, the tubers being often sold by nurserymen in this country—to which it was introduced by Mr. Bentinck, afterwards Lord Portland, in 1690 (Bot. Reg. l.c.). It is a herbaceous perennial, climbing over the bushes, amongst which it usually grows, by means of the tendrils at the ends of the leaves, very suggestive of " honeysuckle," and the name " African honeysuckle " has been heard applied to it. Propagated by tubers, the long stems—8–10 ft. high, and sarmentose branches requiring some support.

Ref.—" *Gloriosa superba*, Linn., Marâthi " (The Poisonous Plants of Bombay), Kirtikar, in Journ. Bombay Nat. Hist. Soc. vii. 1892, pp. 489–493.——" The Constituents of *Gloriosa superba*," Clewer, Green & Tutin, No. 169, The Wellcome Chemical Research Laboratories; reprint from Trans. Chem. Soc. cvii. 1915, pp. 835–846 and in Pharm. Journ. [4] xl. May 29th, 1915, p. 746.——" *Gloriosa superba*: Its Poisonous Constituents," Pyman, in Chemist & Druggist, July 31st, 1915, p. 164.

Gloriosa virescens, *Lindl.*; Fl. Trop. Afr. VII. p. 563.

Ill.—Bot. Mag. t. 2539, t. 4938, t. 5216 (*Methonica grandiflora*, Hook. = var. *grandiflora*, Baker); Fl. des Serres, ix. (1853–54), t. 865 (var. *Plantii*); Fl. des Serres, ii. (1846), tt. 163–164 (*Methonica Leopoldi*, Lem. = var. *grandiflora*, Baker); Ill. Hort. viii. 1861, t. 273 (*Methonica grandiflora* = var. *grandiflora*, Baker); Peters, Mozamb. t. 54 (*Methonica Petersiana*),

t. 55 (*M. platyphylla*); Gartenfl. xxxvii. 1888, p. 292 (var. *grandiflora*); Wiener, Ill. Gart.-zeit. 1895, p. 285; Wood, Natal Pl. iv. t. 396.

Vernac. names.—Agananmaigbo, Eweaje(Ebute Metta, *Millen*); Egwarere (Benin, *Farquhar*); Ewa-aje (Yoruba, *Farquhar*); Ewa-aje (Lagos, *MacGregor*, *Dawodu*); Umakhu (Aguku, S. Nigeria, *Thomas*).—African Methonica (Bot. Mag. l.c.).

Lagos, Aboh, Lower Niger, Benin, Lokoja, Bornu; also known from the Cameroons, Sierra Leone, and widely distributed in Tropical Africa, in Natal and Madagascar.

Like the foregoing, a handsome decorative plant, to which the same general particulars will apply; well known in cultivation. The flowers as in *superba* are bright red-yellow; but the perianth segments are not crisped, or only slightly so; they are also sometimes tinged outside with green—this being more or less so in the early flowering stage of both species.

COMMELINACEAE.

Palisota, Reichb.

Palisota Barteri, *Hook.* f.; Fl. Trop. Afr. VIII. p. 29.

Ill.—Bot. Mag. t. 5318; De Candolle, Monogr. Phanerog. iii. (1881), t. 5.

Cameroons, Fernando Po.

A decorative plant cultivated at Kew; stems 1–5 in., leaves near the base about 24 in. long and 4½ in. across. Inflorescence a dense panicle with 100–250 flowers.

Palisota thyrsiflora, *Benth.*; Fl. Trop. Afr. VII. p. 31.

Ill.—De Candolle, Monogr. Phanerog. iii. (1881), t. 5, f. 4.

Vernac. names.—Ojo (Lagos, *MacGregor*, *Phillips*); Jangborokun, Rogbo Agutan (Lagos, *Dennett*); Ikpele Oku (Awka, S. Nigeria, *Thomas*); Doomwi, Esita (Sierra Leone, *Lane-Poole*); Ndomi (Sierra Leone, *Scott Elliot*).

Lagos, Old Calabar, Aboh, Oban, and widely distributed in West Africa from Senegambia to the Cameroons and the Congo.

Stems 3–15 ft. long. A decorative plant; used commonly for hedges, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 43).

Commelina, Linn.

Commelina nudiflora, *Linn.*; Fl. Trop. Afr. VIII. p. 36.

Ill.—Webb & Berth. Isles Canaries, Phyt. iii. t. 238 (*Commelyna agraria*); Rchb. Icon. Hort. Bot. t. 136; Clarke, Commel. et Cyrt. Bengal, t. 1 (*C. communis*).

Vernac. names.—Balasa or Balasaya; Kununguru (Hausa, *Dalziel*).

Katagum, Opobo, Old Calabar, Cameroons and widely distributed in Tropical Africa and generally in the tropical and warm temperate regions of the world.

Gathered as cattle fodder, Hausaland (Dalziel, Hausa Bot. Voc. p. 12).

A common weed; stems 1–2 ft. long, more or less decumbent. One of the plants recommended to check or destroy the growth of "Lalang" (*Imperata arundinacea*) in Malaya (Agric. News, Barbados, viii. 1909, p. 312); but also stated to be wrongly reputed to kill Lalang grass on Rubber Plantations (Agric. Bull. Str. Sett. & Fed. Malay St. 1909, p. 8; Kew Bull. 1909, p. 80); see also under *Passiflora foetida*, p. 326.

Aneilema, R. Br.

Aneilema beniniense, *Kunth*; Fl. Trop. Afr. VIII. p. 68.

Ill.—Palisot de Beauv. Fl. Oware and Benin, ii. t. 87 (*Commelina beniniensis*); Thonner, Blütenpfl. Afr. t. 16.

Vernac. names.—Tsidaun Kare (Hausa, *Dalziel*); Godawgbaw-Odo (Yoruba, *Millson*); Abalaja, Okobogu Oji (Aguku, S. Nigeria, *Thomas*).

Lagos, Old Calabar, Yoruba, and widely distributed in Tropical Africa.

Decoction used as a laxative for children, Yoruba (Millson. Kew Bull. 1891, p. 214).

Stem trailing, 1–2 ft. long, rooting near the base.

PALMAE.

Areca, Linn.

Areca Catechu, *Linn.*; Fl. Trop. Afr. VIII. p. 99.

Ill.—Bentley and Trimen, Med. Pl. t. 276; Greenish, Mat. Med. p. 221, and in at least 24 other works.

Areca Nut or Betel Nut Palm, Catechu Palm, Pinang (Borneo).

Cultivated in India, Ceylon, South China, Philippine Islands, Malaya, Siam, Borneo, and in Zanzibar and parts of East Africa; grown in the Botanic Gardens of Old Calabar, Lagos, Laeken and Eala.

The Areca Nut or seeds are used for medicinal purposes, but chiefly in India and other Eastern countries as a masticatory, or for chewing together with Betel Pepper (*see* p. 553), although in Siam—where in addition to home-grown nuts over 5,000,000 lb. of betel-nuts are imported from India, Singapore, and Java—it is stated, the advance of Western civilisation has led to a decrease in betel-chewing, and an attempt has been made to introduce American chewing-gum as a substitute (Chem. and Druggist, Oct. 28th, 1911, p. 629). Preparations of the nut are used for toothpaste and powder in Europe; but the chief use in this country is that of the powdered seeds as a vermifuge for dogs (Greenish, Materia Med. p. 222).

To grow to perfection this palm requires a rich somewhat damp soil, moist atmosphere and a perennial high temperature.

The foliage is always a fresh green, and the fruit does not appear to be eaten by animals (Beccari, Wand. Gr. Forests, Borneo, Eng. Ed. p. 27).

It is a tree 40–50 ft. high and upwards; trunk, 6 in. or so in diam., uniformly straight. Leaves about 6 ft. long. Spadix including male and female flowers. Fruit about 2 in. long, orange or bright red in colour when ripe.

Ref.—" Semen Arecae," in Pharmacographia, Flückiger & Hanbury, pp. 669–672.——" *Areca Catechu*," in Med. Pl., Bentley & Trimen, No. 276, 6 pages.——" The *Areca* or Betel Nut Palm," in Dict. Econ. Prod. India, Watt. i. 1889, pp. 291–301.——Cultivation of the Betel Nut Palm in the Bombay Presidency, Mollison, in Agric. Ledger, No. 4, 1900, pp. 31–39. ——" A Plague in the Betel Nut Palms : Report on a Tour in Eastern Bengal," Watt. l.c. No. 8, 1901, pp. 129–179.——" Areca Catechu " in " The Palms of British India and Ceylon," Blatter, in Journ. Bombay Nat. Hist. Soc. xxiv. 1916, pp. 329–338.

Podococcus, Mann & Wendl.

Podococcus Barteri, *Mann* & *Wendl.*; Fl. Trop. Afr. VIII. p. 100.

Ill.—Trans. Linn. Soc. xxiv. 1864, t. 38, f. A, t. 40, f. B, t. 43, f. A.

Brass (Barter No. 1837, Herb. Kew); River Nun (Niger) and in the Gaboon.

Fruit edible, very fragrant (Barter, l.c.).

Stem erect, 5–8 ft. high, slender—9 lin. diam.

Sclerosperma, Mann & Wendl.

Sclerosperma Mannii, *Wendl.*; Fl. Trop. Afr. VIII. p. 101.

Ill.—Trans. Linn. Soc. xxiv. 1864, t. 38, f. C, t. 40, f. A.

Gaboon—in swampy places—no specimen from Nigeria, but probably not limited to the Gaboon.

Leaves used for roofing and constructing the walls of huts, being tied between the petioles of Raphia (Mann & Wendland, Trans. Linn. Soc. l.c. p. 426).

A slender-caespitose palm, stem short; leaves, 10–13 ft. long.

Arenga, Labill.

Arenga saccharifera, *Labill.* in Mém. Inst. Par. iv. (1801), p. 209.

Trunk, 20–40 ft. high. Leaves many, 20–28 ft., leaflets up to 115 in each side 3–5 ft. long. Male spadix 4–5 ft., simply branched. Female flowers solitary, 1 in. in diam. Fruit 2–2½ in. long, oblong-turbinate, base narrowed, top rounded or depressed (Fl. Br. India, vi. p. 421).

Ejow or Gomuti Palm, Sugar Palm, and a Sago Palm.

Malaya, East Indies, Molucca Islands, Philippine Islands; cultivated in Malacca, Siam, Cochin China; introduced to Jamaica and to the Botanic Gardens of Lagos, Old Calabar (1907), Laeken and Eala.

A source of Palm sugar or Jaggery, said to be the oldest species used by civilised man for this purpose, the sap—obtained from the stem of the male inflorescence—in comparison with that of other sugar-yielding plants is of very low acidity, and when exposed to air it readily ferments. It has been found that in the process of clarification heating the sap to boiling point or treatment with alcohol, sterilizes the sap and precipitates impurities (Hines, Philippine Agric. Review, 1914, p. 225; Agric. News Barbados, 1914, p. 244). Spirit or "Arrack" may be distilled from the sap or "toddy," this being of importance in Java, the Philippines, etc., the yield being shown to be "each litre of sap containing 14 per cent. sucrose gives 70 grams of absolute alcohol, provided there is perfect oxidation and no loss, or about 80 cc. of 20 per cent. alcohol, namely, 28 litres for each tapping" (l.c.), or when the tree flowers—at about ten years old—"toddy" may be drawn at the rate of about 3 quarts a day for a period of approximately two years (Kew Bull. 1912, p. 125).

In the Philippines a hectare of land containing from 150 to 200 trees is estimated to produce under modern cultural methods some 20 or more tons of marketable sugar per annum over a period of 10–15 years (Philippine Agric. Review, l.c.); in Java, where the tree is said to flourish at an altitude of about 1,800 ft., after 12–13 years and lasting from 3–5 years it is estimated that an acre can be planted with 160 trees, which, producing 500 lb. of sugar per tree, will theoretically give a total production of 80,000 lb., equal to 35 tons per acre at the end of from 15–20 years, or an average of from 2–2¾ tons per year (Treub (Java) U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 142, 1909, p. 46; Agric. News, Barbados, 1909, p. 159).

A black stiff horse-hair like fibre is obtained from the bases of the leaf stalk, used for ropes, cordage and brushes, valuable for resisting wet. The young albumen preserved in syrup is well known as a preserve in the Straits Settlements (Griffith. Palms of B.E. India, p. 164), and when the tree dies a sago is obtained from the trunk by splitting it up, scraping out the cellular portion, washing it and granulating the starch (Mus. Kew).

The palm dies when the fruit is ripe or after tapping. It is very ornamental and worth cultivating for this purpose, as well as for sugar and spirit. It is raised from seed, and plants in permanent places require a distance apart of about 20 ft. Forty plants of this palm were put out at Old Calabar Garden, July 1908 (Ann. Rep. Bot. Gdns.).

Ref.—"*Arenga saccharifera,*" in Med. Pl., Bentley & Trimen, No. 276, 4 pages.——"The Sago Palm of Malacca and Malaya,"

in Dict. Econ. Prod. India, Watt. i. 1889, pp. 302–304.——" Sugar Palm: *Arenga saccharifera* (*Saguerus pinnatus*)," Treub in U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 142, 1909, pp. 45–47.——" The Sugar Palm," Barrett, in Philippine Agric. Review, May 1914, pp. 216–221.——" Sugar-Palm Sap," Hines, l.c. pp. 222–228.——" The Sugar Palm," in Agric. News, Barbados, xiii. Aug. 1st, 1914, p. 244.——" *Arenga saccharifera*," in " Fibres from the Belgian Congo," Bull. Imp. Inst. xv. 1917, pp. 493–494.

NIPA, Thunb.

Nipa fruticans, *Thunb.* in Vet. Akad. Nya. Handl. Stockh. iii. (1782), p. 231.

A low branched palm; stem or root-stock stout more or less flattened, developed along the surface of the ground. Leaves similar to those of the coco-nut and may exceed 30 ft. or more in length (Beccari). Fruit resembling that of a *Pandanus* or " as large as a man's head," carpels 4–6 in. long, smooth brown (Beccari & Hooker, f. Fl. Br. India, vi. p. 424).

Ill.—Rumpf. Amb. i. t. 16; Lam. Encycl. t. 897; Blume, Rumphia, ii. t. 105, iii. tt. 164, 165 (spadices, parts of fruit); Blanco, Fl. Filip., t. 386; Griffith, Ic. Pl. Asiatic, tt. 244–247; Gaudichaud, Voyage Bonite, tt. 6, 7 (spadices and parts of fruit); Martius, Palm. iii. tt. 108, 171, 172; Vidal, Fl. For. Filip. t. 94 c; Schimper, Bot. Mitth. Tropen. iii. t. 7 (fruits, &c.); Karst. & Schenck, Veg. bild. i. t. 7 (Nipa formation bei Tandjoeng Prioek, Java); Beccari, Great Forest, Borneo, p. 81, f. 19; Journ. Bombay N.H. Soc. xxiv. 1916, t. 95 (habit).

Vernac. names.—Nipa, Sasa (Guam, Philippines, *Blatter*); Gulga, Gabna, Golphal (fruit), Golpatta (leaves) (Bengal, *Gamble*).——Nipa Palm, Water Coco-nut Palm.

A coast palm found in the Sundribuns of India, in Burma, Malaya, Queensland, Ceylon, Philippines, Borneo and in the salt marshes of the islands and coasts of the Indian Ocean. Introduced into Nigeria, where in 1906 a plantation at Old Calabar was established (Thompson, Col. Rep. Misc. No. 51, 1908, for 1906, p. 49), seeds obtained from the Botanic Gardens, Singapore (l.c. p. 90), and a new plantation was started at Oron, 1912 (Evans, Ann. Rep. Dept. Agric. S. Nig. 1912, p. 12).

Leaves used for making cigarettes, Borneo (Burbidge, Mus. Kew).

The young white leaves are used to make bags and mats called " Kajang " for covering boats or making partitions in houses, and the epidermis is used in making cigarettes, the " rokos " or cigarettes which Malays continually smoke with great zest are all rolled in this, in Borneo (Beccari, Great Forest, Borneo, p. 81).

The mature leaves are used for thatch, for which purpose the leaflets are stripped from the rhachis and formed into a thick fringe on a reed; said to be superior and more durable than coconut thatch. The pounded leaves are recommended

as a remedy for the bites of centipedes and as a cure for ulcers, and when burnt they yield a supply of salt; hats and cigar cases are made of them in India. The leaf-stalks are used in floating logs in the Sundribuns of Bengal, and as fishing floats (Watt, Blatter, *seq.*; Blanco, l.c.) and in the Museum there is a sample of paper-stuff, from the Bally Paper Mills, India (India Office, 1898).

The trade in "Golpatta" leaves in the Sundribuns amounts yearly to about 135,000 tons (Gamble, Man. Ind. Timb. p. 730).

The young fruits are edible (l.c. and in Dict. Econ. Prod. India).

This palm is an important source of alcohol, especially in the Philippines—sample of spirit in the Museum, Kew ("Vina de Nipa")—where (1910) approximately 90,000,000 litres of sap were distilled yielding 9,023,323 litres of proof alcohol (Gibbs, *seq.*, Kew Bull. 1912, p. 126). The flowering or fruiting spadix is tapped for "tuba" in about the fifth year after planting; being cut near the top, a thin slice is removed each day to keep the wound open; the flow continues for about 3 months, the average daily flow from each tree is 0·579 litre, and the yield of alcohol is estimated at from 4–7·5 per cent. It possesses an advantage over *Arenga saccharifera* in its long life—upwards of 50 years (l.c.).

May be raised from seed, which floats readily and as the palm thrives at the mouths of rivers and swampy localities subject to tidal influence, similar to and in association with the conditions under which the "Mangrove" (*Rhizophora mucronata*) grows, it is easy to account for the wide distribution on the littoral of so many countries. From 6 ft. by 6 ft. (approx. 1210 plants per acre) to 10 ft. by 10 ft. (435 plants per acre) would be convenient distances to plant, although in a wild state the plants may be much closer together. Of the small plantation referred to above at Old Calabar, the Curator reports (Ann. Rep. Bot. Gdns. Old Calabar, Dec. 31st, 1908) that "of the thirty-nine plants originally planted in the site across the river, thirty plants survived at the beginning of the year and only one has died since; with the water constantly washing over the roots, the seedlings were a long time becoming established and very little growth took place until the commencement of last rains; since then the plants have made vigorous growth and have now from 15–20 fully developed leaves and are rapidly pushing others." In 1911 some 1200 seeds matured, 300 of which were sent to Opobo for planting and the remainder sown at Old Calabar, with a view to transplanting them ultimately at Oron (Ann. Rept. Agric. Dept. S. Nigeria, 1911, p. 14).

In 1917 the Director of Agriculture reports (Trade Suppl. Nig. Gaz. Aug. 30th, 1917, p. 98) that "the plot of Nipa Palms introduced by Sir Walter Egerton in 1906 had grown sufficiently to allow of leaves being cut, and a 'bush' store house was being thatched with them," and that "there is very little doubt that these leaves provide a far more durable thatching material than any indigenous leaf."

Ref.—"The Nipa Palm, *Nipa fruticans*," Gibbs, in The Philippine Journ. of Science, vi. April 1911, "The Alcohol Industry of the Philippine Islands," pp. 110–143, Pls. i.–viii.——"The Nipa Palm as a Commercial Source of Sugar: A Consideration of the Principal Difficulties encountered in Collecting and Preserving Nipa-Palm Sap," Pratt, Thurlow, Williams & Gibbs, in The Philippine Journ. Science, viii. (Sect. A. Chem. & Geol.) Dec. 1913, pp. 377–398.——"The Nipa Palm," Matthews, in The British North Borneo Herald, Sept. 1st, 1915.——"Nipa," Blatter, in The Journ. Bombay Nat. Hist. Soc. xxiv. 1916. "The Palms of British India and Ceylon," pp. 686–688.

Phoenix, Linn.

Phoenix dactylifera, *Linn.*; Fl. Trop. Afr. VIII. p. 102.

Ill.—Gaertner, Fruct. Sem. Pl. i. t. 9, f. 2; Lam. Encycl. t. 893; Jacquin, Collect. v. t. 15, f. 3; Duhamel, Traite des Arbres, iv. tt. 1 bis, 2 bis, 3 bis; Delile, Egypte, t. 62; Plenck, Ic. t. 726; Dict. Sc. Nat. tt. 25, 26; Mem. Mus. Paris, iii. 1817, t. 15 (Anatomie fruct.); Desc. Ant. iv. t. 274; Nees von Esenbeck, Plant. Medic. Düsseld. i. t. 37; Martius, Palm. iii. t. 120; Gallesio, Pomona, Italy vi. tt. 1–4; Gaudichaud, Voyage, Bonite, t. 124; Burnett, Pl. Util. ii. t. 51a; Zippel, Ausl. Handels Nährpfl. t. 45; Beccari, Malesia, iii. t. 43, f. 1; Ehrenberg, Symbol. t. 10; Foureau, Mission Sahara, p. 502 (habit); Karst. & Schenck, Veg. bild. v. tt. 34–35; Le Jardin, 1909, p. 313; Rev. Hort. 1910, p. 569, f. 240; Journ. Bombay N. H. Soc. xx. 1911, t. 8; U.S. Dept. Agric. Bur. Pl. Ind. Inv. Seeds & Pl. No. 32, 1914, t. 3 (fruit); No. 34, 1915, t. 3 (habit); Goldman Exp. Lower California, Contr. U.S. Nat. Herb. xvi. part xiv. 1916, t. 107, f. B (habit at San Angel); Agric. Journ. Egypt, v. 1915, t. 11.

Vernac names.—Dabino (Hausa, *Dalziel*, *Parsons*); Date Palm.

Cultivated in N. Africa.—Morocco to Egypt, in Mesopotamia, Palestine, Persia, Arabia, India, California, Arizona, etc. in the S.U. States; West Indies—Jamaica, Dominica, Trinidad; Australia, Canary Islands and many hot dry countries.

"Dates" are well known as a fruit imported in a dried state into the United Kingdom from Turkey in Asia, France, British India, Persia, Egypt, Gibraltar, etc.

Date-Cake is made and sold by the Arabs to the Monks at Mt. Sinai, Palestine, and resold to visitors (Mus. Kew).

In desert regions like that of the Sahara in Northern Africa, this fruit is of first importance to the inhabitants and in Mesopotamia as well as being of importance to the people dates are largely used for feeding cows (Kew Bull. 1908, p. 286; 1919, p. 77).

Baskets, ropes, and cordage are made from the leaves in Egypt and India; the blanched leaves come in large quantities from the South of France—where they are grown largely on

the Riviera for the purpose—for use in Churches on Palm Sunday and huts and houses are made of the wood in N. Africa (Mus. Kew), where also the membrane of coarse fibre which covers the bases of the leaves is used in making ropes, baskets, mats, etc. and mixed with camel's hair makes a strong cloth for the caravan tents of the desert nomads (Johnston, Journ. African Soc. Jan. 1904, p. 179). In Mesopotamia the branches supply fuel and material for hutting, household furniture, and fencing; the fruit stalks are converted into brooms; rope called "Kumbar" is made from the date fibre; the leaves are woven into matting and beds, chairs, cages, and coops; the trunks are used in house-building and bridge-making, for water-pipes and gutters (Kew Bull. 1908, p. 286).

The fruits yield a spirit used locally in Syria, Egypt, Nubia, etc. (Kew Bull. 1912, p. 116. Morewood, Hist. Inebr. Liquors p. 51). In Mesopotamia the variety "Zahdee" is used for distilling "arak" or spirit, this being considered the best for the purpose (Kew Bull. 1908, p. 286). In Zaria, N. Nigeria the palm is stated to be of great use in house-building, making native "rain-coat" mats and for wine (Parsons, N. Nig. Gaz. April 30th, 1910, p. 102), and in Kábi [Kabba], Nupe, Ilorin, &c. Dr. Baikie writing from Bida, Feb. 18th, 1862, states that the fruit is an important article of food (Technologist, iii. 1863, p. 104).

This palm is comparatively easy to cultivate and flourishes in a hot, dry atmosphere, rich well-drained soil, with a good supply of water at the root, and it will stand a few degrees of frost Propagation may be effected by means of seed or by off-shoots. The latter method is the best, especially so when good varieties—of which there are many under cultivation—require to be perpetuated. Offshoots—3–6 years old—weight about 6 lb. (Fletcher, Agric. Ledger, *seq.*), or the larger the better—average weight about 12 lb. (Kew Bull. 1908, p. 283) are recommended. A few plants of male trees are necessary at wide intervals for fertilisation. Fletcher (l.c.) recommends one male tree for every hundred female trees. There is little doubt that an offshoot from a male tree would come true to type; but until the flowering stage it would seem to be uncertain amongst seedlings—two indications suggested are that male plants are stronger with stiffer leaflets and grow more quickly than female plants (*see* Kew Bull. 1914. pp. 159–162 on "The Sex of Date Palm Seedlings"). It may be mentioned that the "Manakor" —also called "the Bey's date," a rare and excellent variety, is reproduced from seed, because the old trees do not bear offshoots; but it is said to prove fairly constant, especially in the Djerid Oasis, Algeria, where good strains are to be found (Trabut Bull. Agric. de l'Algérie et de la Tunisie, May 1st, 1913, p. 185; Bull. Bur. Agric. Int. Rome, iv. 1913, p. 1247). In the field a distance of 10–15 ft. (Kew Bull. 1908, p. 283) or 25 ft. (Fletcher, l.c.) apart is recommended for planting. Irrigation will be necessary

until the plants are established and, more or less at all stages of growth, depending on situation—whether near rivers subject to periodical inundations, as on the Nile, or to tidal influence, or where the roots can reach the sub-soil water. There is an old Arab saying to the effect that this palm likes its feet in the water and its head in the oven. Trees raised from suckers bear fruit in from 4–5 years, increasing in value up to about 8–10 years and are believed to continue yielding for upwards of a century. Artificial fertilisation is usually necessary, the time of year may vary according to climate, the method being to cut up the male spadices immediately they open (or are ready to open) into parts of a few flowers each, and then—as in Mesopotamia for instance (Kew Bull. l.c. p. 284), "the cultivator climbs the tree, opens the bunch of female blossom slightly, and deposits in it a few sprigs of the male blossom." Fruits are ripe in about 150 days from the date of fertilisation (l.c.). The yield may vary considerably but from 100–200 lb. per tree per annum might be considered good. In Egypt the fruits are classified as dry, semi-dry and soft, the first containing a high proportion of sugar are sun-dried and keep indefinitely, including "Gondaila" and "Sakkoti"—to suit some tastes they require to be soaked in water before eating—; the second which may in a dried state be packed loosely in boxes to keep without fermenting, "Amry"—largely exported to Europe and "Aglani," being the chief varieties cultivated and the third with a comparatively small proportion of sugar, commonly eaten in a fresh ripe state, including the varieties "Aisha," "Bint," "Amhat," "Hayani," "Samani," "Zaghlool," "Siwi" and the variety "Saidi"—said to be the most important date in all the Oases (Brown, Agric. Journ. Egypt, *seq.*). In Mesopotamia the varieties exported are "Hallawee"—the best kind at Basra, ripens early and is packed in boxes for export generally, "Khadrawee"—packed in boxes for export to the United Kingdom, America, and the Continent, also to Egypt, Tunis, and Oran (Algeria), "Sayer," "S'Amran," "Zahdee" and "Deree" (Kew Bull. 1908, p. 285).

The "Tafilat" variety, raised from seed—one of several kinds obtained by Kew from the East in 1890 for distribution among the then newly formed Botanic Stations in the West Indies—produced fruit at the Dominica Botanic Garden in 1907 or after 17 years; the female trees had borne flowers for several years before; but the first male tree admitting of fertilisation flowered in the year stated; suckers, it was urged, were necessary to continue the experiment (Agric. News Barbados, Oct. 5th, 1907, p. 308). In 1913, suckers ("djebars") of "Tafilat" ("Tafilalet") fetched 40*s*. per guaranteed "djebar" and those of "Deglet-nour" cost 4*s*. each in Algeria, and it was recommended to grow them in Nurseries for a supply of suckers, as being more profitable than for the production of dates (Trabut, Bull. Agric. de l'Algérie et de la Tunisie, May 1st, 1913, pp. 185–187: Bull. Bur. Agric. Inst. Rome, iv. 1913, p. 1247).

"Deglet-nour" or "Daglat-nūr" and "Tafilat" are good commercial varieties of North Africa. The former has been introduced into Arizona and California (1900), beginning to bear fruit in 1903; but the fruit has not been found to ripen without artificial methods—incubation in a moist atmosphere at a temperature of 43°—49° C. has proved successful, and slow ripening at a low temperature is under experiment—owing to the extreme dryness of the autumn in the deserts of the South Eastern United States; although it can be ripened on the trees in many of the oases of the Algerian and Tunisian Sahara (Comptes Rendus, 155 (1912), p. 549; Bull. Bur. Agric. Int. Rome, iii. 1912, p. 2452).

In Nigeria the varieties grown are "Zabiya" or "Jan dabino"—a long red sweet variety, and "Maga" or "Dan-damana"—a stoneless date (Dalziel, Hausa Bot. Voc. p. 19). More than 50 years ago the palm was reported, in Azben [Sahara—beyond the confines in the North of Nigeria] northern parts of Hausa, in Kabi [Kabba], etc., but a few are found in South Hausa, in Nupe, where they bear fruit, at Ilorin and Lokoja (Baikie, at Bida, Feb. 18th, 1862, Technologist, iii. 1863, p. 104). It is fairly common in the town of Zaria and plentifully distributed along the rivers in the district (Parsons, l. c.) and fruits are sometimes sold in the markets towards the south, being commonly seen in Kano (Dudgeon, Agric. & For. Prod. W. Afr. p. 156). The cultivation in the Northern Provinces, especially at the higher altitudes, might be extended with advantage by introducing some of the good sorts referred to.

Ref.—"Central-Afrikanische Datteln," Vogel (signed at Murzuk, 1st Oct. 1853), in Bonplandia, ii. 1854, pp. 74–75—list of 37 varieties.——"*Phoenix dactylifera;* the Edible Date Palm," in Dict. Econ. Prod. India, Watt, vi. part 1 A, 1892, pp. 199–206.——"Date Production in Bussorah," in Kew Bull. 1898, pp. 46–50.——"The Date Palm," Toumey, University of Arizona, Agric. Exp. Station Bull. No. 29, 1898, pp. 102–150 illust. (Tucson, Arizona, June 1898).——"Sur la Culture du Palmier Dattier," Schweinfurth, in Revue des Cult. Col. x. 1902, pp. 83–88; 175–178; 244–247; 299–303.——Persian Gulf Dates and Their Introduction into America, Fairchild, U.S. Dept. Agric., Bureau of Pl. Industry, Bull. No. 54, 1903, pp. 1–32; pls. i.–iv.——The Date Palm and Its Utilization in the S.W States, Swingle, U.S. Dept. Agric., Bureau of Pl. Industry, Bull. No. 53, 1904, pp. 1–155, pls. i.–xxii.——"The Common Date Palm (*Phoenix dactylifera*)," Johnston, in Journ. of the African Soc., Jan. 1904, pp. 177–182.——Phoenix dactylifera (The Date Palm); Notes on Date Palm Cultivation in Countries other than India, Fletcher, in Agric. Ledger, No. 1, 1906, pp. 1–17, with Table i. "Approx. Number of Trees in Date-growing Centres"; ii. "Humidity and Rainfall"; iii. "Temperature"; iv. "Some well-known Varieties of Dates"; Cultivation; Soil, &c.——"*Phoenix dactylifera,*" in the Commercial Products

of India, Watt, pp. 882–885 (Murray, London, 1908).——"Cultivation of the Date Palm in Mesopotamia," in Kew Bull. 1908, pp. 283–286.——"*Phoenix dactylifera*," in "The Palms of British India and Ceylon," Blatter, in Journ. Bombay Nat. Hist. Soc. xx. 1911, pp. 680–694.——Date Growing: In the Old World and the New, Popenoe, pp. 1–300; illustrated and with descriptions of 90 of the most important varieties of dates in the United States (West India Gardens, Publishers, Altadena, California, 1913).——The Date Sugar Industry in Bengal; An Investigation into Its Chemistry and Agriculture, Annett, Lile & Amin, Dept. of Agric. India, Memoir (Chemical Series). ii. No. 6, March 1913, pp. 1–389; pls. i.–ix.——"The Propagation of the Date Palm," Ralph, in Pomona College Journ. Economic Bot. iii. No. 1, Feb. 1913, pp. 418–423.——"The Sex of Date Palm Seedlings," in Kew Bull. 1914, pp. 159–162.——"The Effect of Climatic Conditions on the Rate of Growth of Date Palms," Vinson, in The Bot. Gazette, Chicago, lvii. No. 4, April, 1914, pp. 324–327.——"The Date Palm in Egypt," Brown, in Agric. Journ. Egypt, v. parts 1 and 2, 1915 (Cairo 1916), pp. 63–79, pl. xi; vi. 1916, (Cairo 1917), pp. 18–38.——"Dates from the Sudan," Bull. Imp. Inst. xiv. 1916, pp. 585–589.——"The Date Palm in Egypt," Agric. News, Barbados, xvi. May 5th, 1917, p. 139.——A Report on Experiments on the Improvement of the Date Palm Sugar Industry in Bengal, Annett, Pal & Chatterjee, in Memoirs Dept. Agric. (Chem. Series) India, v. Sept., 1918, pp. 69–116.——The Date Palm and its Cultivation in the Punjab, Milne, pp. 1–153; pls. 1–50 (Thacker, Spink & Co., Calcutta; published for the Punjab Govt. 1918).

Phoenix reclinata, *Jacq.*; Fl. Trop. Afr. VIII. p. 103.

Ill.—Jacq. Fragm. Bot. t. 24; Martius, Palm. iii. t. 164; Ill. Hort. 1859, p. 85; Fl. & Pom. 1871, p. 135; Kerchove, Palmiers, t. 22, f. 121; Beccari, Malesia, iii. t. 44, f. 1 (parts of fruit, &c.); Gartenfl. xxxvi. 1887, p. 477; p. 479, f. 122 (*P. spinosa*); Notizbl. Bot. Gart. Berlin, No. 45, 7th Nov. 1909, App. xxii. p. 44, f. 16 (*P. spinosa*); Johnston, Uganda, i. p. 96 (*P. spinosa*); Bull. Agric. Congo Belge, iii. 1912, p. 996.

Vernac. names.—Ekkehobi (Yoruba, *Unwin*); Ngalu (Awka, S. Nigeria, *Thomas*); Makindu (Victoria Nyanza, *Dawe*); Sundutundu (Niger, *Barter*); [Okun (Yoruba), Okukon (Benin) *Thompson*].

Bonny and generally in the Niger Delta. Found in Senegal, Sierra Leone, Gold Coast, in the Nile Land, Lower Guinea, Congo, Mozambique and S. Africa.

The fruits are eaten, River Nun (Barter, Mus. Kew), also in Sierra Leone where the leaves are used to make hats (Oldfield. Herb. Kew); fruits much liked by the natives in Accra, where the young leaflets before the leaves expand are used for the plaiting of hats and caps (Mann & Wendland, Trans. Linn. Soc. xxiv. (1864) p. 425); leaves extensively employed in Nupe and Zaria for making fine mats (Baikie, Technologist, iii. 1863, p. 104) and the palm on the Victoria Nyanza—where it is common—

is used for building purposes (Dawe, Bot. Miss. Uganda, 1906, p. 59).

This palm is comparatively low-growing, 3–4 ft., leaves about the same length, favouring river banks and edges of creeks. Dr. Baikie (l.c.) in a communication dated Bida Feb. 18th, 1862, mentions the "Spiny Date" as being found in the deltas of the Nun and Brass Rivers, in the upper parts of Yoruba, in Nupe, Kambari, Záriva, Bautsi [Bauchi], Kororofa and Adamawa, generally with Oil Palms.

LIVISTONA, R. Br.

Livistona Jenkinsiana, *Griff.* in Calc. Journ. Nat. Hist. v. (1845) p. 334.

Trunk 20–30 ft., 6–7 in. in diam. Leaves 5–6 ft. in diam. Spadices 2–3 ft. Flowers clustered on small tubercles, small, greenish, ebracteate. Drupes $\frac{3}{4}$–1 in. in diam. leaden blue (Fl. Br. India, vi. p. 435).

Ill.—Griffith, Palms of B.E. India, t. 226 A (leaf), B (spadix & fruit).

Native of Assam.

Leaves used for making umbrella hats, and thatching roofs of boats, and for covering the tops of Palanquins in Assam (Watt, Dict. Econ. Prod. India).

Two fine specimens reported growing at Ebute Metta.

METROXYLON, Rottd.

Metroxylon Sagu, *Rottb.* in Nye Samml. Dansk. Vidensk. Selsk. Skrift. ii. (1783) p. 527.

Stem 25–35 ft. high, which can hardly be encircled by a man's arm (Beccari) or about 20 ft. with many basal offshoots, as stout as that of the Cocoa-nut. Leaves as in the Cocoa-nut, but more erect, unarmed. Inflorescence appearing when the plant is about 20 years old; spadices several, terminal spikes, 5–8 in. Flowers minute. Fruit globose, size of a small apple (Fl. B. India, vi. p. 481).

Ill.—Konig & Sims, Ann. Bot. i. 1804, t. 4 (*M. Sago*); Dict. Sc. Nat. tt. 32, 33 (*Sagus officinale*); Martius, Palm. t. 102; Griffith, Palms of B.E. India, tt. 181 (*Sagus Konigii*), 182 (*S. laevis*); Bentl. & Trimen, Med. Pl. t. 278.

Spineless Sago Palm, Sago Palm.

East Indies, common in Sumatra and adjacent islands and in Borneo; cultivated in the Malay Peninsula.

The starch extracted from the trunk—about the time the palm is showing for flower—is imported into this country as "Sago," chiefly from Borneo. It is also recommended as a source of sugar and alcohol.

The Palm dies after flowering, but it is reproduced from suckers.

Some Sago palms planted in the hollow in the Gardens at Old Calabar were reported to be in excellent condition 1906 (Thompson, Col. Rep. Misc. No. 51, 1908, p. 49) and continuing to thrive, as also some at Ibadan, 1911 (Ann. Rep. Agric. Dept. S. Nigeria 1911, p. 14). Recommended for cultivation in the swamps of parts of the Philippine Islands (Barrett, Philippine Agric. Rev. 1912, p. 333); but in general only cultivated in Borneo and native habitats.

Ref.—" Sago," in Agric. Bull. Malay Peninsula, May 1893, pp. 62–78.——" Sago Cultivation in North Borneo," Kew Bull. 1894, pp. 414–417.——" Sago," l.c. 1897, p. 420.——" Sago," in Wanderings in the Great Forest of Borneo, Beccari, pp. 287–288 (Constable & Co. Ltd. London, Eng. ed. 1904).——" Sago Making in Ceram " in Journ. Roy. Soc. Arts, lix. Jan. 20th, 1911, pp. 222–225; extracts in Agric. News, Barbados, March 18th, 1911, p. 85.

RAPHIA, P. Beauv.

Raphia Hookeri, *Mann & Wendl.*; Fl. Trop. Afr. VIII, p. 107.

Ill.—Trans. Linn. Soc. xxiv. 1864, t. 39, f. B, t. 42, f. A; Agric. Col. iv. 1910, tt. 3, 4; Webbia, iii. 1910, p. 114.

Vernac. names.– Ukot (Old Calabar, *Holland*, *Mann*); Wine Palm.

Old Calabar, Cameroons, Spanish Gaboon, &c.

Palm Wine or " Mimbo " of Old Calabar is obtained from this tree by cutting off the inflorescence when it begins to show. The natives of Old Calabar make cloths, &c. from the epidermis of the leaves, and from the leaflets they make mats for roofing, though said not to be so lasting as those made from the leaflets of *R. vinifera* (Mann & Wendland, Trans. Linn. Soc. xxiv. 1864, p. 425), to which tree the uses ascribed here may also apply.

Stem about 30 ft. high, 1 ft. through; leaves about 40 ft. long; petioles strong, 10–12 ft. long; leaflets 4–5 ft. long. Found in humid places along the coast, commonly cultivated. Propagated from seed. The natives are careful to keep up a supply of this palm; " the pleasant taste of the wine obtained " —Mann (l.c.) remarks—" has ever been sufficient to overcome the innate idleness of the natives of Old Calabar and has induced them to cultivate it." It is planted on higher ground in the neighbourhood of village compounds, as it does not favour the swampy conditions under which *R. vinifera* thrives.

Raphia vinifera, *P. Beauv.*; Fl. Trop. Afr. VIII. p. 106.

Ill.—Palisot de Beauv. Fl. Oware, Benin, i. tt. 44, f. 1, 45, 46, f. 1; Desc. Ant. i. t. 33; Trans. Linn. Soc. xxiv. 1864, t. 42, f. c; Martius, Fl. Bras. iii. pt. 2, t. 62, f. 1 (fruit & sections); Sim, For. Fl. & For. Res. Port. E. Afr. t. 98, f. B; Agric. Col. iv. 1910, t. 6, ff. 4–7; Webbia, iii. 1910, p. 91, f. 5 (flowering parts, &c.); Rev. Hort. Belge, xxxvii. 1911, p. 186; Bull. Agric. Congo Belge, iv. 1913, p. 164, f. 50 (at Eala).

Vernac. names.—Tukuruwa (Hausa, *Dalziel, Shaw*); Igi-oguro, eriko Akpako (Yoruba, *Moloney*); Mali, Nyiad (Port. E. Afr. *Sim*); Gwangwala (Nupe, *Dalziel*); Durwi (Mendi, Sierra Leone, *Unwin*); Korosso (Gambia, *Dudgeon*); [Ako (Yoruba), Augor (Benin) *Thompson*].—Bamboo Palm, Tombo Palm, Wine Palm.

Old Calabar and Niger Rivers, Oware, Benin, Sierra Leone, Gold Coast, Liberia, Congo, Angola, B.C. Africa, Nyasaland, &c.

To the Natives of West Africa this palm probably equals in importance the "Oil Palm" (*Elaeis guineensis*). The leaflets are commonly used for making mats and articles of so-called clothing; the petioles for making huts and beds, for roofing and canoe poles, split into narrow lengths they are made into screens—bound together with fibre from the leaves of the same palm—by prisoners, Old Calabar (Holland, Mus. Kew, 1899). The soft inside part of this long midrib of the leaves, often upwards of 30 ft. in length "is used for making a large kind of mat used in travelling, called by the Hausas and in Nupe 'Memme'; the fibre of the midrib is also woven with cotton into a kind of cloth in Benin and Yoruba. Fruit (the mesocarp) bitter, occasionally eaten and in a few places oil is made from it" (Baikie, Technologist, iii. 1863, p. 104). "Piassava Oil"—probably from this species—from Sierra Leone, was reported on as similar in character to palm oil (*Elaeis guineensis*) and saleable if obtainable in commercial quantity, at similar prices (Bull. Imp. Inst. 1918, pp. 37–38). In places where the *Elaeis* is scarce the oily substance between the scaly exterior of the fruit and the kernel, although bitter, is eaten with yam, cassada, &c.; and the oil pressed out of it is, by the women, thought superior to that of *Elaeis* for dressing the hair (Mann & Wendland, Trans. Linn. Soc. xxiv. (1864) p. 245); the mealy layer, between the husk and the hard nut, is eaten in Munchi as a food and also used for medicine, &c. The plaited articles made from the leaf in N. Nigeria include a kind of water-proof hood and cowrie bags. "Bami" or palm-wine is stated to be usually made from this species (Dalziel, Hausa Bot. Voc. p. 97). Palisot de Beauvois (l.c.) states that the negroes of Oware and Benin call the wine made from the sap "Bourdon."

"Raffia" fibre is obtained from the epidermis (including the cuticle) of the leaf of *Raphia pedunculata*, Beauv. (*R. Ruffia*, Mart.) of British East Africa and Madagascar, may also be obtained from this species and samples from Lagos were reported in 1895 as equal to the Madagascar product in colour and texture (Kew Bull. 1895, p. 288), and at that time some small shipments had been made from West Africa (l.c. p. 89). This fibre the principal source of which is Madagascar, realised in January 1913, 25*s.*–31*s.* per cwt. and in January 1920 was quoted at 40*s.*–50*s.* per cwt. (Mon. Circs. Ide & Christie). Rafia is commonly used in gardens as a tying material, for which purpose it first came into use about 1872. The more important

trade product obtained from the West African species is that of the fibre extracted from the petioles or leaf stalks, known as "Lagos Bass," "African Bass" or "Piassava." Beginning in 1891 at Lagos the trade has been of steady value and the amount shipped from Nigeria in 1910 was 319 tons, value £3,916, of which 297 tons were shipped from Calabar and Ikang—6 tons of the whole went to Germany, remainder to the United Kingdom (Lagos Customs & Trade Journ. July 17th, 1911, p. 139). In 1913 efforts were being made to improve the output of Piassava fibre and the introduction of a suitable machine, it was expected, would make it more successful (Ann. Rep. For. Adm. S. Nigeria, 1913). Valued (Jan. 1913) for "good," £24–27, "medium," £23 and "common" £18 per ton, with "Para Piassava" (*Leopoldinia Piassaba*, Wallace) at £44–54, £34–38 and £28–32 for corresponding qualities (Mon. Circ. Ide & Christie); in January 1920 the quotations were for "good" £48–52, "medium" £40–46 and "common," £30–35, with "Para Piassava" at £60–65, all per ton (l.c.). Full particulars of this fibre from Lagos are given in Kew Bull. 1891, pp. 1–5, and from Liberia, 1910, pp. 169–171, including preparation and trade particulars. There are trade samples of "Piassava" from Cape Palmas, Akassa and Gaboon in the Museum at Kew (Messrs. J. Puddy & Co. London, 1900).

The method of preparation for export is simple; the strong bases of the leaves are cut up into the desired length, placed in water—preferably running—where they are left until the softer parts have decayed; they are then beaten until the fibre is free of all extraneous matter and cleaned by being drawn through nails closely driven into a board rack. After being sun-dried the fibre is ready for market (U.S. Cons. Rep. Washington, No. 352, 1910, p. 213; Kew Bull. 1910, p. 170). The method of extraction is similar—steeping and beating out in Sierra Leone (Dudgeon, Agric. & For. Prod. B. W. Afr. p. 31).

This palm has only a comparatively low trunk, but the leaves are 6–7 ft. long with spiny leaflets. In the Eastern district of Lagos it is reported (Millen, Kew Bull. 1893, p. 184) that the banks of the Lagoon and the creeks which run into it have scarcely any other vegetation than the Bamboo Palm with stretches of mangroves. The "Bamboo" Palm is referred to as the commonest tree in the swamps and low-lands which line the waterways of the Colony of Lagos. Dense thickets of these palms, traversed only by the palm-wine gatherer or the bamboo cutter, push their way into the lagoons and extend over the flood-grounds to a distance of from 15–20 miles up the river valleys into the interior (Moloney, l.c. 1891, p. 3). On the Gold Coast, the Sibiri stream, an important feeder of the Ankobra is subjected to very heavy floods in the rainy season and overflows its banks to a large extent; when the water falls at the end of the wet season the overflow remains in the hollows and gives rise to a succession of swamps that are occupied by a dense growth of the "Tombo" Palm (*Raphia vinifera*), *Calamus* and

Ancistrophyllum (Thompson, Col. Rep. Misc. No. 66, 1910, p. 178). It is under similar conditions that the palm may be seen growing in the neighbourhood of the Calabar and Cross Rivers.

The cultivation does not appear to have been given much consideration in West Africa, and the only details available, as showing the period of development, are from seeds sent out from Kew to Dominica in 1893. It was reported in 1912 that "a considerable number of plants was raised and distributed and an avenue was formed in the Botanic Gardens at Dominica; these have developed into medium sized palms, having leaves of from 6–8 ft. or more in length with spiny leaflets; the largest specimens have recently fruited, their large spadices of imbricated shining fruits attracting a good deal of attention" (Agric. News, Barbados, Nov. 23rd, 1912, p. 372). This species obviously reproduces itself more freely than *R. Hookeri* and that so far there has not been the same need to plant. It is hoped, however, that conservation will not be neglected and that the only class of fibre trade allowed to continue or develop will be that of the "bass" or "Piassava" for brush-making. The production of "raffia" fibre—the tying and weaving material, from the young leaves is very destructive to the tree, and the trade in this may very well be left to other countries, as above indicated where it can be obtained from palms that do not yield the brush material.

Ref.—"West African Bass Fibre (*Raphia vinifera*"), Kew Bull. 1891, pp. 1–5.——"Rafia from West Africa," Kew Bull. 1895, pp. 88–92; pp. 287–288 and in Add. Ser. II. "Veg. Fibres," pp. 232–238.——"Le Rafia" Deslandes, in L'Agric. Pratique des pays chauds, v. 2, 1905, pp. 22–33; pp. 128–141.——"African Bass or Piassava (*Raphia vinifera*)," Hillier, Kew Bull. 1910, pp. 169–171.——"Le Palme del Genere *Raphia*," Beccari, in Agric. Col. Italy, iv. 1910, pp. 137–170, including *R. vinifera*.——"The Raffias of French Equatorial Africa," Rouget in Bull. de l'Office Colonial, June 1915, pp. 273–294 and in Bull. Agric. Inst. Rome, Oct. 1915, pp. 1342–1344.——"Piassava Industry of B. W. Africa," in Bull. Imp. Inst. xiii. 1915, pp. 555–556.——"Raffia or Bass: Its Production, Preparation and Utilisation," l.c. xv. 1917, pp. 434–440, Madagascar and also W. African Raffia.

CALAMUS, Linn.

Calamus Barteri, *Becc.*; Fl. Trop. Afr. VIII. p. 109.

Ill.—Ann. Bot. Gard. Calcutta, xi. 1908, t. 20.

Vernac. names.—Erugbo or Erogbo (S. Nigeria, *Dennett*); Tembi (Sierra Leone, *Scott Elliot*). Tie-Tie (Old Calabar, *Holland*).

Onitsha and Niger Territory in general; Sierra Leone, &c.

Stem much used in the Lower Niger river region for making rope (Barter) and the split stems are commonly used in Old Calabar and other parts of the Colony for tying up fences and

similar purposes. The ring or handle of native Kola baskets is made from the same material (Chem. & Druggist, Jan. 28th, 1893, p. 156—*C. Draco*).

The stems are 30–50 ft. long and about ½–¾ in. in thickness usually growing on trees; where the undergrowth is dense and the ground moist, the bright red fruits making a striking appearance at certain periods.

Calamus deerratus, *Mann & Wendl.*; Fl. Trop. Afr. VIII. p. 108.

Ill.—Ann. Bot. Gard. Calcutta, xi. 1908, t. 19.

Vernac. names.—Nwatia, Ohyeali (Ashanti, *Chipp*).

Cameroon and Bagroo Rivers, Ashanti, &c.

Split stems used for binding, Ashanti (Cummins, No. 128, Herb. Kew); the palm is described as a "Marsh-monsoon forest rattan" of Ashanti (Chipp, No. 127, Herb. Kew) climbing to a height of 15–30 ft. Cameroon and Bagroo rivers (Mann, Herb. Kew).

ONCOCALAMUS, Mann & Wendl.

Oncocalamus acanthocnemis, *Drude*; Fl. Trop. Afr. VIII. p. 111.

Vernac. name.—Ikan (S. Nigeria, Benin, Imp. Inst. specimen in Herb. Kew).

Benin (Imp. Inst. No. 5, 1906), also found in the Gaboon and Congo.

A sample of the stems of this palm under the name of "Ikan Cane" was reported on as suitable for basket making, for which purpose it might find a market, suggested at the time that a few bundles of 100 canes, 8–10 ft. long, should be forwarded for technical trial (Col. Rep. Ann. No. 601, 1909, p. 30), and so far, it would appear, of the climbing palms mentioned here this is the only one that could be suggested as a possible substitute for the "Rattan" Cane (*Calamus Rotang*) of India.

The stems are slender (3 lin. thick), reed like, sparsely covered with blackish reflexed spines, growing in intertwining masses (bush ropes) in the woods. Gaboon (Büttner, Fl. Trop. Afr. l.c.), attaining 10 metres in height, marshy soil, Bolobo, Congo (Hens, No. 170, Herb. Kew).

Oncocalamus Mannii, *Wendl.*; Fl. Trop. Afr. VIII. p. 111.

Ill.—Trans. Linn. Soc. xxiv. 1864, t. 41, f. E; t. 43, f. E (*Calamus Mannii*).

Lagos (Millen No. 18: Barter, No. 20,220, Herb. Kew), and known also from the Gaboon River.

Stems about 60 ft. long, 6–12 lin. thick (Fl. Trop. Afr. l.c.); 20 ft. in swamps, Lagos (Barter, l.c.), 25 ft. high, Gaboon (Mann. Herb. Kew).

ANCISTROPHYLLUM, Mann & Wendl.

Ancistrophyllum secundiflorum, *Wendl.*; Fl. Trop. Afr. VIII. p. 115.

Ill.—Palisot de Beauv. Fl. Oware, Benin, i. tt. 9-10 (*Calamus secundiflorus*); Trans. Linn. Soc. xxiv. 1864, t. 38, f. D; t. 41, f. G; t. 43, f. C (*Calamus secundiflorus*).

Vernac. names.—Okakan, Ikan (S. Nigeria, *Dennett, Dunstan*).

Old Calabar, Benin, Niger Delta, Cameroons, also in Sierra Leone, Angola, French Congo and Congo Free State.

Stems used for binding together the materials of which the huts are constructed, West Africa; fish traps are made of the stem, Degema, New Calabar (Holland, Mus. Kew, 1899); the Bafan people also make large cylindrical baskets of this in which to carry the rubber manufactured by them, and the same people take large quantities of this palm with them as food when they go into the hills of the Sierra del Crystal to procure the rubber. For this purpose they choose the extremities of the stem, cutting off the leaves to make the bundles more portable, and when required for use they simply roast the whole in the fire and then eat the soft central part, which is, however, rather bitter and tough for persons not accustomed to such primitive fare (Mann & Wendland, Trans. Linn. Soc. xxiv. 1864, p. 425).

A climbing palm, 80–100 ft. mouth of the Niger (Mann, No. 453, Herb. Kew); stem 100 ft. high, 1 in. in diam., climbing on lofty trees by its hooked petioles, bearing large clusters of very beautiful red fruits (Barter, No. 61, Herb. Kew).

The following references refer to the climbing palms in general. "Rattan" is the name given to more than 100 species of the genus *Calamus*, natives of intertropical Asia and Africa (Kew Bull. 1899, p. 200). *Calamus Rotang*, Linn., of India and Ceylon and *C. scipionum*, Lour. the "Malacca Cane," a native of Siak, (Kew Bull. 1892, p. 46) are important trade sources of cane.

Ref.—"Rattan Industry of Rheims," Kew Bull. 1899, pp. 200–201.——"Rattans," in Agric. Bull. Straits & Fed. Malay States, ii. April 1903, pp. 129–136; May 1903, pp. 157–160.——"Notes on the Collection of Rattans in the Straits Settlements Court," Bull. Imp. Inst. i. 1903, pp. 153–154.——"*Calamus*" Beccari, in Annals, Bot. Garden, Calcutta, xi. 1908, pp. 1–518 illustrated.——"The Rattans or Rotangs" Hemsley, in Gardeners' Chronicle, xlvi. Aug. 7th, 1909, pp. 87–88.——"Rattans or Rotangs," Agric. News, Barbados, xi. June 22nd, 1912, pp. 202–203.

Borassus, Linn.

Borassus flabellifer, *Linn*, var. **aethiopum,** *Warb.*; Fl. Trop. Afr. VIII. p. 117.

Ill.—Rheede, Hort. Mal. i. t. 9 ("*Carimpana*"—*arbor foemina*); t. 10 ("Ampara"—*arbor mascula*); Rumpf, Amb. i. t. 10; Lam. Encycl. t. 898; Roxb. Pl. Corom. i. t. 71, t. 72 (spadices); Martius, Palm. tt. 108, 121 (spadices) t. 162 (habit); Engler, Veget. Deut. Ost. Afr. tt. 9–10 (var.); Engler, Pflan. Ost. Afr. B. p. 21 (var.); Johnston, Uganda, i. pp. 134, 191 (var.); Karsten & Schenck, Veg. bild. iv. t. 12 (Borassus-Hain in der

Steppe bei Ho Im Vordergrunde Andropogon-Arten); Ann. Mus. Col. Marseille, v. 1907, p. 379, f. 3, p. 385, f. 4; viii. 1910, p. 46, f. 11 (in Madagascar); Butler, Memoirs Dept. Agric. Bot. Series, India, iii. 1910, t. 1 (Palmyras in Godavari); Journ. Bombay, N.H. Soc. xxi. 1912, tt. 38, 39; De Wildeman, Mission E. Laurent, p. 25, t. 5; Webbia, iv. pt. 2, 1914, pp. 297, 312, 315 (*flabellifer*, fruit); pp. 297, 329 (*aethiopum*, fruit).

Vernac. names.—Giginia (Hausa, *Dalziel*); Dutbi (Fufulde, N. Nigeria, *Dalziel*); Sibboo Colom (Gambia, *Moloney*,) Vjye-tjo (E. Africa, *Schumacher & Thonning*); M'Vooma, Meelalla (Unyam-wezi, *Speke & Grant*); Morintshi (Nupe, *Barter*); [Agbon Olodu, Igoti (Yoruba), Oluwa (Benin), Kube (Akwapim), Ma Kube (Ashanti) *Thompson*]; Deleb (Nile region, *Speke & Grant*); Deleib (Sudan, Col. Rep. Ann. No. 778, 1913, p. 44); Taubin (Burma, *Aubert*); Ronier (French, *De Gironcourt*).—Palmyra Palm, Black Run Palm; African Fan Palm.

Native of India, Ceylon and Tropical Africa; in West Africa from Senegal to the Cameroons, in the Nile Land, the Congo and Mozambique District. Introduced to the Seychelles.

Almost every part of this palm is put to some use; it is in the hinterlands, of practically the same value to the natives as the Coco-nut is nearer the sea. The pericarp of the fruit is edible, Gold Coast (Thompson), French West Africa (de Gironcourt) and the kernels are only eaten when quite young (*Ibid.*); fruit edible and pleasant, though with a slight terebinthine flavour; pulp beaten with milk in Hausa. Root-buds of seeds—spindle-shaped bodies—are roasted and eaten and are very palatable (Baikie, l.c. p. 104) in Nigeria—there is a bundle of 6 done up something like leeks in this country (collected by Barter in Nupe) in the Museum at Kew—also eaten in India and Ceylon. The leaves are used for thatching and for manufacturing into many useful articles, as Cowrie purse—made of the cuticle of the leaf—Niger (Barter) bags, mats, fans, rice sifters, provision baskets, etc. A salt is prepared from the leaves by the Pagans and poorer Fulani in N. Nigeria (Dalziel, Kew Bull. 1910, p. 141). Walking stick knobs have been made from the powdered seeds of " Ronier " in Paris (Perchat, Mus. Kew). Siamese and Hindoo books from the leaves and an ink-pot (Mohammedan) made of the seeds from the Gambia are in the Museum at Kew. The kernels have been suggested as a substitute for " Coroso," " Vegetable Ivory " or " Ivory Nut " (*Phytelephas macrocarpa*) and a price of £16 per ton was offered (1912) at Hamburg (De Gironcourt, Ann. Sci. Agron. Paris, Oct. 1913, " The Palmyra and Dum Palms in West Africa, pp. 408–419: Bull. Bur. Agric. Inst. Rome, v. 1914, p. 82), their dirty yellow tint detracts from their value; but they appear to be regarded as a valuable asset to French West Africa (l.c. and in La Geographie, Paris, Jan. 1912, pp. 50–52). A report on " Deleib " nuts from the Sudan (1912) at the Imperial Institute was that " they were too fibrous to be of value for button-making and there seems no prospect of

finding a market for them in Europe unless they can be shipped in a very much better condition" (Col. Rep. Ann. No. 778, 1913, p. 44).

The wood is hard, heavy and durable—a specimen in the Kew Museum (India Forest Dept. Burma) has sp. gr. 0·774 = 48·35 lb. per cubic ft.—used for building houses in the Upper Senegal and Niger (De Gironcourt, l.c.), the straight stems are very suitable for house-posts and bridge piles, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 90); used for building purposes, Gambia (Kew Bull. 1892, p. 46), for dug-out canoes, water pipes and gutters for roofs and open water channels, India (Kew Bull. Sept. 1887, p. 18).

From the unopened spathes a sap is drawn, known in India as "toddy," from which the spirit "arrack" is distilled; slices of the young flowering stalks are made for several days in succession; an earthen pot into which the sap runs is tied to the end of the stump and if the juice is to be drunk fresh, the pot is coated with lime inside, in order to prevent fermentation; the sap is yielded at the rate of 3–4 quarts a day for 4–5 months, The tree begins to yield when about 15–20 years old and goes on for about 50 years; but once in 3 years, it is recommended to discontinue the tapping, or the tree would die; the female tree yields about half as much sap again as the male. The juice is richer in sugar than most other palms and 3 quarts of juice are said to make one pound of "jaggery" (India) or "Tannyet" (Burma), the production of which is an important industry in India, Burma and Ceylon (Kew Bull. 1912, p. 124; Watt. Comm. Prod. India, p. 171).

The fibre obtained from the leaf stalk similar to "Piassava" comes into commerce from India under the name "Palmyra," (also "Bassine"), valued 1913, for "good," £32–37, "medium," £22–25 and for "common," £12–19 (Mon. Circ. Ide & Christie, Jan. 15th, 1913) and at the present time (1920) for "good bold," £80–85, "assortment," £66–67, "assortment dyed," £85–90, "unassorted," £60-65 and for "dyed and sized" £70–105 (l.c. Jan. 15th, 1920), the total amount delivered for the year 1917—2,661 tons, 1918—1,002 tons and 1919—3,462 tons (l.c.). This may be obtained from the sheathing bases of the leaves in much the same way as for "Piassava" (*Raphia vinifera*), by beating and combing, drying in the sun. In India it is found that good fibre is only procurable from the female palmyra; for export it is made up in bundles of different sizes, from 8–21 in. long, 3–4 in. through: it takes from 1,000–1,500 leaves to make 1 cwt. of fibre, and it is calculated that a man and a boy working hard for 5 days should beat out about a maund [$82\frac{2}{7}$ lb.] of fibre; it is used for brooms, brushes, and for caulking ships (Watt, Thurston, Agric. Ledger, No. 20, 1894: Proc. Agric. Hort. Soc. Madras, July–Sept. 1905, pp. 52–54).

May be propagated from seed, which it is recommended should be sown where it is required to grow as a permanency;

the seed first sends a shoot downwards to a depth of 3–4 ft. and then from the bottom of this shoot the bud which forms the stem is developed (Woodrow, Blatter). These "root-buds of seeds" for use as a vegetable—as described above—are taken as an annual crop in October and November. The tallest of African palms, trees of 70–80 ft. being often met with, remarkable for the great swelling of its trunk, generally about two-thirds from the ground; of very slow growth (Baikie, l.c.). Seedlings set out in inferior soils where coco-nuts are handicapped have reached 7 ft. 8 in. in 3 years, Seychelles (Dupont, Ann. Rep. Agric. Seychelles, 1915; Agric. News Barbados, 1917, p. 163). In Malabar, where the annual rainfall is about 100 in., the Palmyra Palm is raised from seed dibbled in the ground *in situ*, a definite stem is formed above ground in about 6 years and commences to yield fruit in about 19 years, lasting from 50–60 years. In Coimbatore—rainfall about 20 in.—seeds are planted during the south-west or north-east monsoons in well-ploughed land; they germinate in about a month, the first leaf appears above ground after about 3 months, a fresh leaf being formed about every month thereafter; the stem rises above ground in from 2–3 years under good cultivation and after about 5 years leaf-sheaths may be obtained which yield a fibre ["Palmyra fibre"] for brush-making and the rate of growth while the stem is young is from 12–18 in. a year (Fischer, Indian Forester, 1912, p. 51).

The palm is found on the plains of Yola (Dalziel, Kew Bull. 1910, p. 141) and in situations much drier and higher than, as a rule, those of the Coco-nut (*Cocos nucifera*) and approximately where the one begins the other ends from the sea in many parts of Nigeria. Baikie (l.c.) records the nearest approach to the sea along the river Niger in Ibo nearly 150 miles up; in Yoruba very near the sea, abundantly scattered throughout Nupe, Borgu, along the banks of the river Binuwe, [Benue], Bornu, &c. —elephants abound wherever it is plentiful as they are very fond of its fruit. In the Ibadan territory, the Bale and Council of Ibadan at a meeting held on the 8th November 1912 passed a resolution imposing a fee of one shilling for each Fan Palm felled, a resolution which received the approval of the Governor (S. Nig. Govt. Gaz. Jan. 29th, 1913, p. 99). It is very abundant on the Gambia, in Combo, where in many places it forms forests of considerable extent often very dense (Kew Bull. 1892, p. 46). On the Gold Coast near Sekondi it is common in the grasslands close to the sea, the rainfall here being much below 50 in. a year (Thompson, Col. Rep. Misc. No. 66, 1910, pp. 16, 62); it is also to be met with in the Savannah forests (l.c. p. 9), very characteristic of the open country in the valley of the Sumin River (l.c. p. 90), and abundant on the Afram plains in the extreme North Eastern portion of the Colony (l.c. p. 74). Both this palm and *Hyphaene* (*q.v.*) are plentiful on the banks of the Lower Shire River near Chiromo, in the vicinity of Lake Nyasa

(Bull. Imp. Inst. vii. 1909, p. 61). Cultivated and run wild in the plains of India and Ceylon (Watt, Comm. Prod. India p. 170.)

Ref.—The Palmyra Palm, *Borassus flabelliformis*, Ferguson, pp. 1–52 (Colombo, 1850 and 2nd ed. 1889).——"The Palmyra or Fan Palm," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 495–504.——"Palmyra Bass Fibre (*Borassus flabelliformis*)," Kew Bull. 1892, pp. 148–150.——The Palmyra Palm: Its Occurrence, Cultivation and Uses, Thurston, in The Agric. Ledger, No. 20, 1894, pp. 1–12.——"Palmyra Fibre," Morris, in Journ. Soc. Arts, xliii. 1895, pp. 930–931.——"*Borassus flabellifer*," (La Flore du Nord-Ouest de Madagascar), Jumelle, in Ann. Mus. Col. Marseille, v. 1907, pp. 372–389.——"*Borassus flabellifer*," in Comm. Prod. India, Watt, pp. 169–171.——"*Borassus flabellifer*" (Contributions à l'étude anatomique des plantes textiles Exotiques, Palmiers, &c.), Claverie, in Ann. Mus. Col. Marseille, vii. 1909, pp. 114–117.——"Fécule de *Borassus flabellifer*," Planchon & Juillet in Ann. Mus. Col. Marseille, vii. 1909, pp. 504–507.——"The Bud-Rot of Palms in India," Butler, in Memoirs Dept. Agric. India, Bot. Series, iii. Sept. 1910, pp. 221–280.——"The Manufacture of Palm Sugar in Upper Burma," Aubert, in Agric. Journ. India, vi. 1911, pp. 369–376, illustrated.——"Arrack Distillery in Negombo," in Report on a Visit of Investigation to a few parts of India and Ceylon, Dupont, pp. 35–37 (Seychelles, 1912).——"Palmyra Palms," in Bull. Imp. Inst. x. 1912, p. 326; from Indian Forester, xxxviii. 1912, p. 51.——"*Borassus flabellifer*," "Leaves from Mozambique," Bull. Imp. Inst. x. 1912, pp. 377–378, with analyses for manufacture of Paper.——"Le Ronier et la Valeur de ses Noix," De Gironcourt, in La Geographie, xv. Jan. 1912, pp. 50–52; abstract in Bull. Bur. Agric. Inst. Rome, iii. 1912, pp. 953–954.——"*Borassus flabellifer*," "The Palms of British India and Ceylon," Blatter, in Journ. Bombay Nat. Hist. Soc. xxi. 1912, pp. 930–968.——"*Borassus flabellifer* (Studio sui *Borassus*: Descrizione di un Genere Nuovo Asiatico di Borasseae)," Beccari, in Webbia (Edit. Martelli, Firenze) iv. part 2, 1914 pp. 304–321.——"Uses of the Palmyra Palm," Journ. Roy. Soc. Arts, lxiv. Jan. 7th, 1916, pp. 151–152.

HYPHAENE, Gaertn.

Hyphaene thebaica, *Mart.*; Fl. Trop. Afr. VIII. p. 120.

Ill.—Duhamel, Traite des Arbres, iv. tt. 1, 2, 3; Delile, Egypt, tt. 1–2 (*Cucifera thebaica*); Dict. Sc. Nat. tt. 28, 29 (*Douma thebaica, Cucifera thebaica*); Martius, Palm. iii. tt. 131–133; Fl. des Serres, xi. 1875, tt. 2152–3; Karst. & Schench, Veg. bild. ii. t. 55; Woodrow, Gard. Tropics, p. 576; Agric. Col. Italy, ii. 1908, t. 2, f. 1 (section of fruit); Journ. Bombay, N.H. Soc. xxi. 1912, t. 35.

Vernac. names.—Goriba (Hausa, *Dalziel*); [Mohamma (Berber), Ssehhelib (Tigre) *Speke & Grant*]; Dum or Doum (Sudan,

Dunstan); Dum (Upper Niger, W. Africa, *De Gironcourt*).——Dum, Dom, or Doum Palm (commonly referred to as such), Ginger-bread Palm.

Bornu in N. Nigeria and also known in West Africa from the Gambia and in Nile Land from Nubia, Eritrea, Kordofan, Sennar, Abyssinia, Somaliland and British East Africa (Fl. Trop. Afr. l.c.). Chevalier records it from the Chari region.

The leaves are used for mats and the best kind of hats at Sokoto and Gwandu (Baikie, Technologist, iii. 1863, p. 104), for plaiting various articles, N. Nigeria (Dalziel, Hausa Bot. Voc. p. 40); for tent-making, Somaliland (Bull. Bur. Agric. Inst. Rome, May 1911, p. 1011). It has been found that a very satisfactory paper can be made from them, and they have also been tried by a manufacturer as a material for the production of braiding for straw hats, who reported that they were satisfactory for the purpose, but that the manufacture of braid from them would only be practicable if labour and other conditions would allow of its being undertaken as a local industry in the Sudan (Col. Rep. Ann. No. 882, 1916, p. 15).

A fibre is obtained from the root (Dalziel, l.c.).

At Berber the leaves are made into coarse rope (specimen in the Museum, Kew) and the trunks into beams and posts (Speke & Grant).

Dum palm fruits from Zungeru have been examined at the Imperial Institute; they averaged 2¼ in. in length and 1¾ in. in breadth, the pericarp, which was tough and fibrous, being about ⅜ in. thick, approximately 70 per cent. of the whole, the seed or nut being 30 per cent. and weighing 16·7 kg. per 1000; they were of good quality and quite equal to those received from the Sudan and elsewhere (*see* Bull. Imp. Inst. 1911, pp. 105–109). It was stated that Doum Kernels are not much used at present (1912) in the United Kingdom as owing to the existence of a central cavity they are not so suitable for the manufacture of buttons as are "corosos" nuts (*Phytelephas macrocarpa*). In Italy, where cheap buttons are extensively made there is a small demand for the nuts, but an Italian firm to whom a sample received from East Africa was recently submitted for valuation, mentioned that a small consignment which was received at Genoa remained in store for several months before it found a purchaser at about 13*s*. per 100 kg., landed terms; the firm further stated that nuts weighing less than 35–40 kg. per 1000 would not find a market in Genoa and that it would be better to ship nuts weighing 45–50 kg. per 1000 (N. Nig. Gaz. Suppl. Sept. 14th, 1912, p. 264) or approximately 3 times the weight of those from Zungeru.

"Dom palm nuts" to the value of E£14,736 were exported from Port Sudan, Egypt (1912), going mostly to Italy, Germany and the United Kingdom. Stated to be used as a substitute for the "Vegetable Ivory Nut" (*Phytelephas macrocarpa*) (Dip & Cons. Rep. Ann. No. 5026, 1912, p. 5), Dum palm nuts are

exported from the Sudan to some extent to this country, but the chief markets are Italy and the United States; the total exports in 1913 amounted to 1,349,109 kilog.; value £8,190 (Bull. Imp. Inst. 1914, p. 609).

The kernels are made into little perfume boxes at Kano (Baikie, l.c.). Powdered nuts have been recommended as a dressing for wounds (Perchat, Mus. Kew).

The kernel of the unripe nut is eaten raw, the rind of the ripe hard nut is used as food—molasses, sweetmeats and cakes, N. Nigeria (Dalziel, l.c.), and experiments with vegetable ivory nuts (*Phytelephas* and *Hyphaene*)—the waste material in the manufacture—as flour and chips go to show that in combination with other feeding stuffs the material has some value for feeding stock (Bull. Imp. Inst. 1917, p. 119; Kew Bull. 1919, p. 79).

This palm is remarkable for its branching habit; it grows about 10–30 ft. high with a trunk about 1 ft. in diam. and thrives in regions where the rainfall is small. Baikie writing from Bida, Feb. 18th, 1862, (Technologist, l.c.) describes it as "most abundant in Góbir, Maúri, Kábbi [Kabba], Azben, northern parts of Hausa—Bornu, Márgi; scattered in southern parts of Hausa—Nupe, Ilorin, Borgú, the most southern station at Lukoja, where I have planted them." It is a striking feature of the scenery at Gondokoro (Dawe, Bot. Miss. Uganda, 1906, p. 34). In the Upper Niger region it is reported to be disappearing owing to careless exploitation for use with steam engines; South of Timbuctoo it is under reservation and planting is being encouraged in Togoland (Bull. Bur. Agric. Int. Rome, v. 1914, p. 82).

Ref.—Use of Dum Palm Nuts as Vegetable Ivory, Bull. Imp. Inst. ix. 1911, pp. 105–109; extract "Ivory from Palm Nuts" in Lagos Customs and Trade Journ. Nov. 17th, 1911, p. 385, Report on Doum Palm Nuts from Northern Nigeria," Dunstan, in The N. Nigeria Gazette, Suppl. No. 17 of 1912, Sept. 14th, 1912, pp. 264–265.——"The Palmyra and Dum Palms in West Africa," De Gironcourt, in Ann. Science Agronomique, Paris, Oct. 1913, pp. 408–419; Note in Bull. Bur. Agric. Int. Rome, v. 1914, p. 82.——"Vegetable Ivory Nuts" in "Fodders," Bull. Imp. Inst. xv. 1917, p. 119.

Elaeis, Jacq.

Elaeis guineensis, *Jacq.*; Fl. Trop. Afr. VIII. p. 125.

Ill.—Jacq. Hist. Stirp. Am. t. 172; Gaertner, Fruct. Sem. Pl. i. t. 6; Lam. Encycl. t. 896; Desc. Ant. vi. t. 408; Fl. des Serres, iv. 1861, tt. 1492–93; Ill. Hort. 1866, t. 487; Gard. Chron. March 24th, 1877, p. 373, f. 60; Martius, Fl. Bras. iii. pt. 2, t. 73, f. 4, t. 105, f. 1; Queensland Agric. Journ. i. Dec. 1897, p. 458; Koehler, Med. Pflan. iii; Karst. & Schensk, Veg. bild. iv. tt. 25–26; Kew Bull. 1909, p. 48 (fruits); Journ. African Soc. 1909, p. 232; Bull. Agric. Congo Belge, ii. 1911, p. 543; Beccari, Palms, Madagascar, p. 55, f. 46A; Deistel, Trop. Gart. Victoria–Kamerun, p. 28; Farquhar, Oil Palm,

pp. 2, 3, 4, 8 (var. *microsperma*); L'Agric. Col. Italy, viii. 1914, tt. 7–14, tt. 24–26 (vars.) t. 40 (vars.); Journ. Bombay N.H. Soc. xxiv. 1916, t. 84; Tropenpfl. 1919, p. 247 (fruits of "dura," "semidura," "tenera"); Bücher and Fickendey, Ölpalme, Frontispiece, tt. 1–14; Bull. Imp. Inst. xviii. April–June 1920, tt. 1–6.

West African Oil Palm; Oil Palm.

var. **albescens,** *Becc.* L'Agric. Col. (Italy) viii. 1914, p. 62.

Vernac. names.—Abe-fita or Abe-fufu (Gold Coast, *Evans, Beccari*).—White Oil Palm.

Fruits very large, pericarps reddish-white, occasionally streaked with black; nuts hard; oil of a yellowish colour—yield 15 per cent. (Kew Bull. 1909, p. 40).

So far only known from the Gold Coast, where it is scarce.

var. **angulosa,** *Becc.* l.c.

Fruit large, angular, of a red yellow colour (Kew Bull. l.c. p. 37).

Vernac. names.—Okpörö Eyop or Okporo Oyop (Eifik, Old Calabar, *Thompson, Beccari*); Okporokpo (Ibo, *Thompson*); Ikrok Eyop (Ibibio, *Thompson*).

var. **Ceredia,** *Chev.* Les. Veg. Utiles l'Afriq. Trop. Franç. vii. 1910, p. 56; Becc. l.c. p. 42.

Fruit large, deep orange-claret, becoming yellower at the base (Kew Bull. 1909, p. 37).

Vernac. names.—[Osok Eyop (Eifik); Osuka (Ibo), Eduege (Ibibio), *Thompson, Beccari*]; Adesran, Adibe, Abedam adibe (Gold Coast, *Tudhope*); Ceredi (Ivory Coast, *Chevalier, Bucher and Fickendey*).

S. Nigeria, Gold Coast.

The pericarp is very rich in oil, the best of all said to be obtained from this variety in the Eastern Province, S. Nigeria (l.c. p. 37).

var. **communis,** *Chev.* l.c., Becc. l.c.

Characters of the type (*see* Fl. Trop. Afr. l.c. and Kew Bull. 1909, p. 38).

Vernac. names.—Udin (Benin, *Unwin, Beccari, Foster*); [Ope Pamkova (Yoruba); Akponojub (Eifik, Old Calabar), Okparukpu (Ibo) *Hitchins*]; Ok-porukpu (Ibo, *Beccari*); Dilombe or Dipobe (Cameroons, *Hassert*); Kwakwa (Hausa, *Dalziel*).

The predominating variety in the Southern Provinces, Nigeria (l.c.) and in West Africa. Beccari has included in this variety the following forms:—

dura (var. *macrosperma*, Welw.). Fruits pointed at the apex, pericarp very thin, dark-reddish colour; nut hard thick (Kew Bull. 1909, p. 39).

Vernac. names.—Efia Ekpo Oyop (Old Calabar, *Thompson, Beccari*); Abe Pa (Gold Coast, *Tudhope, Evans, Beccari*); [Akporojub (Eifik, Ibibio); Ojina (Ibo); Efiako Eyop (Ibibio); Dé, Ede or Deti (Togoland) *Beccari*] Dé or djè-djè (Dahomey, *Adam*).—Hard shell Palm nut.

Yield of oil by native methods 11·2 per cent. Gold Coast (l.c.).

fatua. Fruits pointed at the apex; pericarp yellowish-red; nuts very hard (Kew Bull. l.c. p. 40).

Vernac. names.—Abe-dam (Gold Coast, *Tudhope, Beccari*).

Yield of oil 11·2 per cent. Gold Coast (l.c.).

leucocarpa.

Vernac. names.—Lolequel (Ivory Coast, *Chevalier, Beccari*), and it is suggested that Af-fiako-jub (Ibo) and Ojuku (Eifik) may belong here (*see* Kew Bull. 1914, p. 287).

semidura. Fruits nearly spherical; pericarp black at the apex and red at the base; nuts hard (l.c. p. 40).

Vernac. name.—Abe-tuntum (Gold Coast, *Tudhope, Evans, Beccari*).

Yield of oil 13·7 per cent. (l.c.).

tenera (*E. guineensis*, var. *microsperma*, Welw.) Fl. Trop. Afr. l.c. p. 125. Fruits like those of the ordinary Oil Palm, but differ in their thinner shell—about 1·5 mm. thick or about the same as that of the "hazel-nut"—and negroes crack them with their teeth, Cameroons (l.c. p. 44); medium in size, similar in shape and colour to "Abe-tuntum," shells of the nut very thin and easily cracked with the teeth, Gold Coast (l.c. pp. 40, 42); comparatively soft, exocarp deep-purple, almost black, mesocarp abundant, full of oil, endocarp comparatively soft, kernel full of oil of a superior quality, S. Nigeria (l.c. p. 37).

Vernac. names.—Ausuku (Ibo, *Hitchins, Farquhar, Beccari*); Asogejub (Eifik, Ibibio, in Ikot-Ekpene and Uyo districts, *Hitchens, Beccari*); Ope-arunfo (Yoruba, *Thompson, Unwin, Dawodu, Beccari*); Lisombe or Isombe (Cameroons, *Preuss*); Disombé or Disombo (Angola, *Welwitsch*); Dégbakou or Degbakoum (Dahomey, *Adam, Beccari*); Dé-dé-bakin (Togoland, *Gruner*); Abobo-be, Yue-wyiam (Gold Coast, *Evans*); Ivioronmila (?) (Benin, *Thompson, Unwin*).—Thin shell variety or soft-shelled nut.

Southern Provinces, Nigeria—in the Agege, Abeokuta and Oshogbo districts, Western Province; to the extent of 30 per cent. in the Eastern Province (l.c. pp. 36, 37)—Cameroons—of only isolated occurrence, is never gregarious, and in some districts does not occur at all (l.c. 1918, p. 198)—Gold Coast, Dahomey, Togoland—spread everywhere in the proportion of about 25 per cent. (l.c. 1909, p. 43), Angola.

Considerable interest has been taken in this form under cultivation and strong hopes have been entertained of its importance for development because of the soft shell on the kernel and therefore comparatively easy to get rid of. The experience gained, so far, (*see* general particulars, *seq.*) almost make it clear that it will never come up to expectations, as the reproduction of the desired character is not sufficiently constant.

var. **gracilinux,** *Chev.* l.c., p. 64. Fruit with abundant pulp, but with shell of the nut absent or reduced to fibrous strands (Kew Bull. p. 42).

Vernac. names.—Digumbé (Angola, *Adam*); Votchi (Dahomey, *Adam, Beccari*); shell-less or soft nut (Gold Coast, *Beccari*).

Not recorded from Nigeria.

var. **idolatrica,** *Chev.* l.c. p. 57 (*E. Dybowski*, Hua, Bull. Mus. i. (1895); *E. Thompsonii*, Chev. Govt. Gaz. S. Nigeria, July 14, 1909. Suppl. p. 25; *E. guineensis*, var. *Thompsonii*, in Farquhar, " Oil Palm " (1912) p. 4). Fruits large, pericarp brick red, nut hard, with 4 or more cores in the endocarp, leaflets joined at the base (Kew Bull. 1909, p. 39).

Vernac. names.—Ope Ifa (Yoruba, *Thompson, Unwin, Dawodu*); Ogiedi, Ogedudin (Benin, *Unwin, Beccari*); Abe-Ohene (Gold Coast, *Evans, Beccari*); Fadé, Agoudé (Dahomey, *Adam*); the King Palm, Sacred Palm or Palmier fetiche.

This appears everywhere to be regarded as a sacred tree; the oil is used in medicine (l.c. p. 46), as " holy oil " in Dahomey (Savariau, l.c. p. 41), and although not over plentiful it seems to be more common in S. Nigeria than elsewhere, it is said to be quite common in the vicinity of Lagos and appears to favour the sandy country bordering the sea-shore and the lagoons; it gets scarcer towards the Hinterland (l.c. p. 35); sparsely distributed in the Benin district (Unwin, l.c. p. 36) exceedingly scarce in the Gold Coast (l.c. p. 40) and in general the chief recommendation would seem to be for decorative purposes. On the examination of samples at the Imperial Institute it has been found to give a low yield of palm oil and kernels (Farquhar & Thompson, " Oil Palm " (1913), p. 6).

var. **macrocarya**, *Becc.* l.c. p. 71.

Niger (Barter, No. 303, Herb. Kew; Mus. Kew, 1859).

var. **Poissonii**, *A. Chev.* Bull. Agric. Inst. Sci. Saigon, i. 1919, p. 154 [*E. guineensis*, sub—sp. *nigrescens*, var. *Poissonii, A. Chev.* l.c.; *E. Poissonii*, Annet, Congrès Agric. Col. Paris, May 24, 1918; Janssens in Bull. Agric. Congo Belge, ix. 1918, p. 225; *E. guineensis*, var., C. H. Wright in Kew Bull. 1913, 92–3 with fig. of fruit. *E. guineensis* var., *diwakkawakka*, Büch. and Fick. Die Ölpalme (1919), p. 26, t. vi. f. 19-fruit.].

Fruit obovoid or subglobose, about 3 cm. long (not including the 1 cm.-long beak) and somewhat constricted at the base, not ventricose as in some varieties, endocarp sclerenchymatous, about 3 mm. thick; perianth accrescent, fleshy, almost enclosing the fruit, its segments have a transverse thickening about 5 mm. from their apices (Kew Bull. l.c.).

Vernac. names.—Ayara Mbana, Ayara Buvana (Eifik, Old Calabar, *Johnson, Wright*); Klude or Klode (Togoland, *Gruner, Wright*); Agodé (Togoland, *Gruner*); Vuakania, Nagazi ya mahele, Basatum (Congo, *Janssens, Wright*); Diwakkawakka or Di-Ouaka-Ouaka (Cameroons, *Bücher and Fickendey*).

An analysis at the Imperial Institute shows the fleshy perianth to contain 69·9 per cent. of oil equivalent to 14·8 per cent. on the whole fruit and 78·2 per cent. on the dry perianth. Fruits as received contained 42 per cent. of oil, *viz.*, 14·8 in the outer

pulpy covering (perianth) and 27·2 per cent. in the ordinary pulp adhering to the nuts. This yield is said to be almost as large as that of the "Abobo-be" (var. *tenera*) of the Gold Coast or the "Asogejub" (var. *tenera*) of S. Nigeria. The yield of kernels in the sample examined was low, being only 12·9 per cent. expressed on the fruits as received (Bull. Imp. Inst. 1913, p. 218).

Specimens of the spadices and fruits of this variety were sent to Kew in Nov. 1912; from the Director of Agriculture, S. Nigeria.

var. **rostrata**, *Becc.* l.c. p. 50. Fruit light red, shading off to claret colour at the end (Kew Bull, l.c. p. 38).

Vernac. names.—[Mbana Eyop (Eifik, Old Calabar), Ekububa (Ibo), Ayarambana Eyop (Ibibio) *Thompson, Hitchens, Beccari.*]

The varieties *macrophylla*, Chev.—the Abu-be or Abubube of the Gold Coast, *macrocarpa*, Chev., *pisifera*, Chev. and *repanda*, Chev.—a variety with green-tinted fruits—do not appear to have been recorded from Nigeria.

West Coast of Africa—Gambia to the Cameroons and Angola; eastward to Lake Nyasa and Zanzibar. Cultivated experimentally in most botanical gardens in the Tropical Colonies—Malaya, Ceylon, India, Queensland, West Indies, etc.; in Borneo (Kew Bull. 1889, pp. 259–267); Sarawak (l.c. 1909, p. 180), also in Sumatra.

Oil from the pericarp is an important article of food in West Africa, where it is also used for cooking purposes and to some extent as an illuminant—for instance, in the neighbourhood of Itu, Cross River, the producers use it for this purpose, but those who have to buy find kerosene cheaper (Nig. Customs & Trade Journ. July 2nd, 1913, p. 361), in Badagry (Lagos) such use is rapidly dying out (l.c. p. 360) and in Oshogbo (S. Prov. Nigeria) "kernel oil" is reported to be used to dilute "palm oil" as an illuminant (l.c. p. 363). Palm Kernels are also used locally for food in Nigeria, though apparently limited—the districts of Arochuku and Ubiaja only being mentioned in the special report called for by the Commercial Intelligence Officer (*seq.*) S. Nigeria (l.c. p. 363) and Kernel oil is used locally in some districts—in Arochuku by the women for mixing with "Camwood" (*see Pterocarpus*, p. 241; and *Baphia*, p. 246) for rubbing on their bodies, in Sapele for rubbing the skin and for medicinal purposes, and in Ogwashi Oku (Asaba) it is used as hair oil, as a skin emollient and medicinally (l.c. p. 363). The use of palm oil for trial by Ordeal is now prohibited by law.

The Kernel oil or fat is used in Europe for purposes much the same as those of the Coconut Oil, in the manufacture of margarine and the residual cake is an important feeding stuff for stock. The Pericarp Oil or "Palm Oil"—so important as a food in West Africa, is used in Europe and generally as a lubricant and in soap and candle manufacture.

The fibre from the leaflets has some local value for fish-nets, and cordage, and fly-whisks are made of the midribs of the leaves

in certain parts of the coast. The petioles are used as torches; but the writer only saw them used once, when natives lit the way with them for about two hours on the way to Insofan (Jan. 19th, 1900), full length petioles being used.

Some particulars of the varieties of this palm were given in Kew Bulletin 1909, pp. 33–49 and the economic uses especially were dealt with in the same year, pp. 161–184, based on reports received from the various Colonies in West Africa. Cultural experiments in Nigeria, Cameroons, Gold Coast, Seychelles, etc., go to show that nothing very definite can be said of them as they do not always come true from seed—this seems particularly remarkable in the thin-shelled variety, " Opearunfo " (Yoruba) " Abo-bo-be " (Gold Coast), or " Lisombe " (Cameroons), which, in many instances, has produced ordinary thick-shelled seed [*see* the Annual Reports Dept. of Agriculture Nigeria, Gold Coast, Seychelles, Malaya, etc., and Kew Bull. 1920, pp. 119–205, where the subject is discussed].

In general the Oil Palm is comparatively easy to cultivate. In addition to a plentiful supply of fresh nuts, seedlings, a few inches in height are common enough beneath the old trees and selected plants grown on in nurseries may be transplanted at the beginning of the wet season, when about 1–3 ft. high, or, say, about 1–2 years old for preference, and may be up to 3 or 4 years old. The number allowed for an acre may be 109 (20 × 20 ft. apart) or 69 (25 × 25 ft. apart). In the Cameroons, where plantations exist in the mountain area, the Upper Cross River and in regions near the Coast about 80 to the acre is recommended (Kew Bull. 1919, p. 198). A good rainfall—50–100 inches and rich soil would appear to be desirable as very fine specimens are commonly seen in the deep alluvium behind the Mangrove belt, but some well-developed trees may also be observed in comparatively poor soil. Situations that suit " cocoa " (*Theobroma Cacao*) would also suit the " Oil Palm " which has already been mentioned (*see* p. 98) as a shade-tree. The trees begin to come into substantial bearing when 8 or 10 years old, up to which time the trunk—often 50 ft. high and upwards in aged specimens—may show little or no signs of development, though the leaves, 10–15 ft. long are fully developed. Nothing very definite can be said as to yield under cultivation, which is still in the experimental stage. Having regard to its importance for food, the Natives sometimes give this palm preferential treatment in the neighbourhood of villages and farms, but as a rule, they depend upon " bush " or wild sources. From a one-acre enclosure of wild palms containing 44 fruit-bearing trees (one thin-shelled variety) the fruit collected during each month of the year (1917) amounted to 290 bunches, giving 3652 lb. of fruit. The weight of oil extracted from a certain number of fruits treated was 7·14 per cent. and the general conclusion was that this acre of wild palms yielded 261 lb. of pericarp oil and 497 lb. of kernels (Johnson, Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1917, p. 8).

Another estimate for full grown trees is a yield of from about 12 bunches of nuts annually, each bunch weighing from 20–56 lb. An average sized bunch contains at least 200 nuts weighing from 7–21 lb.; the annual yield in oil of a tree is at least 7½ lb. and the yield of kernel oil is about one quart per tree per annum (Thompson, Kew Bull. 1909, p. 167). An average bunch of palm fruits weighs 31 lb. and of palm-oil 50 average cobs of fruit yield about 10 imperial gallons (McLeod)—one imperial gallon of cold palm oil weighs 8·2 lb. (Farquhar Oil-Palm, p. 23).

On rich newly cleared forest soil the palm is said to bear its first bunches of nuts when from 7–8 years old. The first bunches are small until at the age of from about 8–10 years they are at their maximum size and are developed at the rate of from 2–12 per tree per annum for practically the whole of the natural life of the palm (l.c.). Pollination by hand may be advantageous.

"As to the number of seasons during which the Oil Palm maintains a maximum yield reports differ. In some accounts the maximum yield is said to be given when a palm is 10 years old, and in others the age is said to be 12 or 15 years. Again, the 10th–20th years are said to be the most prolific period, but more commonly the 15th–30th year is given, though it is also stated that the palms will yield a full crop up to their 150th year." (Kew Bulletin, 1909, p. 183.)

"The tree is very slow growing, and from measurements made in the Agege district of Southern Nigeria reaches a height of six to nine inches in three years, twelve to eighteen inches in four or five years, eight feet in ten years, and thirteen to fourteen feet in fifteen years, and it is estimated that it attains its full height of sixty feet in about one hundred and twenty years." (Bulletin of the Imperial Institute, vii. 1909, p. 360.)

The oil shipped from Lagos is, of all that is shipped from S. Nigeria, the softest, that is to say, it contains the smallest quantity of stearine. Adjoining Lagos, oil from Benin is characteristic as being semi-soft, while that from the Niger, Brass and part of New Calabar contains the largest proportion of stearine of any that comes. From Bonny, Opobo and Qua Eboe we get a soft variety again, and from Old Calabar both kinds seem to come. Owing to the extremely high prices of glycerine recently, Soft oil has been very much more readily saleable than Hard oil, as the percentage of glycerine contained in the Soft oil is very much higher. It has always been a question as to whether this difference in the quality of the oil was due to a different variety of palm and a variation in the soil, or the various modes of preparation (Letter, Chairman of the Company of African Merchants Ltd. Liverpool, 25 Feb. 1910, to Director).

Extracting the oil by means of solvents it has been found by W. R. Ralston, Govt. Chemist, that 32·86 per cent. of Palm oil may be obtained from the pericarp or 10·57 per cent. of the whole fruit, and that 43·96 per cent. of kernel oil may be obtained from the kernels or 8·55 per cent. of the whole fruit (Farquhar, Oil-Palm, p. 23).

The method of extraction from the pericarp commonly practised in the Western Province, S. Nigeria and reported to produce "soft oil" is that "the fruits are separated from the branch with the aid of a cutlass and boiled with water in an iron pot until the pericarp becomes soft; they are then turned into a wooden mortar and beaten with wooden pestles to separate the pericarp from the nuts. The mixture of nuts and fibre which results is put into a circular pit, which has its surface lined with hardened clay; here it is trodden on until any fibrous matter adhering to the nuts is removed. The nuts are picked out and the fibrous mass remaining is hand squeezed, the fibre being discarded. The oily matter which rises to the surface is boiled to evaporate any water present after which the oil is ready for market. The amount of oil extracted by this method varies from 5·5–7 per cent. of the total weight of the fruits.

Experimental extractions from thin-shelled fruits gave 7·5–12·5 per cent. of oil from the pericarp—about 600 thick-shelled kernels or 1400 thin-shelled kernels go to the pound (Johnson, Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1917, p. 8; *see also* Kew Bull. 1892, pp. 204–208—preparation of Lagos Palm-oil; 1909, p. 171—preparation of pericarp oil on the Gold Coast. Farquhar, "Oil-Palm"—"Preparation of Oil," pp. 23–27; Bull. Imp. Inst. xvii. 1919, pp. 262–264—"Trevor Process" of extraction, Poisson's Machinery and Native Methods on the Ivory Coast).

The oil exported from Nigeria amounts to approximately 1½ million cwt. (1915) and of palm-kernels over 3 million cwt. (1915); the figures were approximately the same in 1910 (Oil—1,737,941 cwt.; kernels—3,459,940 cwt.) 1911 (oil—1,586,123 cwt.; kernels—3,537,600 cwts.) and in 1914 (oil—1,450,622 cwt.; kernels—3,249,020 cwt.) [Lagos Customs & Trade Journ. Jan. 17th, 1912: Nig. Gaz. June 13th, 1916]: but it is interesting to note that kernel-oil and cake were exported in 1914 from Lagos and Opobo—35,646 cwt. kernel-oil and 27,640 cwt. of kernel-cake and in 1915 from Lagos—265 cwt. of kernel-oil (Nig. Gaz. Jan. 13th, 1916). Before the war the trade in kernels was largely in the hands of Germany (Kew Bull. 1909, p. 175) from whence the crushers exported large quantities of the oil to this country—a few years ago it was claimed that Germany consumed more than half the world's commercial supply of the produce of Oil-Palms and in addition to her own colonies—Togoland, Cameroons, etc. took palm-oil and kernels to the value of 100 million marks annually from British Nigeria (Kew Bull. 1918, p. 198); but representations (1915) by the West African Section of the Chamber of Commerce—hastened more or less by war conditions—have effectually diverted more of the trade to Great Britain. This result has been materially assisted by the Ministry of Agriculture, under their advice and publication of literature as to the value of the cake for feeding purposes (hitherto nearly all used up on the Continent), by the Imperial Institute and by the Committee specially appointed to consider the question as part

of their scheme to make the markets of Great Britain less dependent upon Foreign Countries for edible nuts [" Shea "—*see* p. 410; Ground Nuts—*see* p. 201] produced in West African Colonies (*see* Nigerian Customs & Trade Journ.; April 17th, 1915, pp. 154–156).

Ordinances have been promulgated from time to time for the protection of the Industry in Nigeria [*see* Native Council Rules relating to the felling of Oil Palms, No. 1, 1913 (Govt. Gaz. S. Nig. May 21st, 1913. The Agricultural Ordinance, 1916 (No. 59, 1918)—to prevent the spread of " bud-rot " by destroying affected trees, and prohibiting " cabbage tapping " for wine] and the directions to Native Travelling Instructors of Agriculture include authority for the prevention of the wholesale destruction of Oil-Palms, either for the purpose of procuring wine from them or when clearing the bush for farms (Thompson, at Oloke Meji, 14th Oct. 1909; Govt. Gaz. S. Nig. Jan. 12th, 1910, p. 42).

Ref.—" Oil Palm in Labuan," Kew Bull. 1889, pp. 259–267·——" African Oil Palm," l.c. 1891, pp. 190–192.——" Lagos Palm Oil," l.c. 1892, pp. 200–208.——" *Elaeis guineensis*," in Med. Pflan. Köhler, iii.——" Die wirtschaftliche Bedentung der Ölpalme," Preuss, in der Tropenpflanzer, vi. 1902, pp. 450–476.——" Note sur le Palmier à huile de la Côte occidentale d'Afrique," Poisson, in Bull. du Museum d'Histoire Naturelle, ix. 1903, pp. 410–415.——" Die Ölpalme in Bezirk Misahöhe, Togo," Gruner, in Der Tropenpflanzer, viii. 1904, pp. 283–291.——Noticia sobre a Palmeira do Dendem, De Almeida, pp. 1–55 (Lisbon 1906); Review, " Le Palmier à Huile dans l'Angola " in Journ de l'Agric. Tropicale, 1907, pp. 329–332; " Zur Ölpalmenkultur," Strunk, in Der Tropenpflanzer, x. 1906, pp. 637–642.——" The African Oil Palm," Evans, in Tropical Life, Oct. 1907, p. 146, illustrated.——" Palm Oil and Kernels," Hillier, in Kew Bull. 1907, pp. 61, 62.——" The Oil Palm," Ridley, in Agric. Bull. Straits & Fed. Malay States, vi. 1907, pp. 37–40.——" Comparison of Palm Fruits from Various Districts on the West Coast," Drabble, in Quarterly Journ. Inst. Comm. Res. in the Tropics, University of Liverpool, ii. Sept. 1907, pp. 126–129.——" A short Note on the Possibilities of the Oil Palm in Cultivation," l.c. iii. Jan. 1908, pp. 15–19.——" Export of Palm Oil and Kernels," in S. Nigeria Govt. Gaz. Extraordinary, No. 46, July 3rd, 1908, pp. 919–921.——" Notes on the Oil Palm of Southern Nigeria," Thompson, in S. Nigeria Govt. Gaz. No. 10, Feb. 5th, 1908, Suppl.——" Le Palmier à huile et le Cocotier en Afrique Occidentale Française," Adam, in L'Agric. prat. pays chauds, viii. 2, 1908, pp. 269–287; pp. 380–389; pp. 466–475; ix. 1, 1909, pp. 35–46; pp. 127–158; pp. 219–243; pp. 327–338; pp. 398–414; pp. 476–492; ix. 2, 1909, pp. 27–40; pp. 123–139; pp. 224–248; pp. 325–338; pp. 408–421; pp. 480–504.——" The Varieties of the Oil Palm in West Africa," Kew Bull. 1909, pp. 33–49.——" The Economic Aspects of the Oil Palm," l.c. pp. 161–184.——" The Oil Palm and its uses," Sarbah,

in Journ. African Soc. 1909, pp. 232–250.——"The West African Oil Palm as a Shade Tree," Agric. News, Barbados, viii. Sept. 18th, 1909, p. 303.——"Investigations in connection with the African Palm Oil Industry," Bull. Imp. Inst. vii. 1909, pp. 357–394.——"*Elaeis*," De Wildeman, in Ann. Mus. Col. Marseille, vii. 1909, pp. 247–259.——Documents sur le Palmier à Huile (Veg. Util. de l'Afrique Tropicale Française) Chevalier, vii. 1910, pp. 1–127. ——"The Oil Palm," in A Transformed Colony: Sierra Leone, Its Progress, Peoples, Native Customs and Undeveloped Wealth, Alldridge, pp. 334–341 (Seely & Co., Ltd., London, 1910).——Le Palmier à Huile, Hubert, pp. 1–314 (Dunod & Pinat, Paris, 1911).——"The African Oil Palm," Band, in the Rubber World, May 4th, 1911, pp. 73–74; May 18th, 1911, p. 105; June 8th, 1911, pp. 150–151.——The Oil Palm and Its Varieties, Farquhar & Thompson, pp. 1–48, illustrated (Crown Agents for the Colonies, 1913).——"The African Palm Oil Industry," Bull. Imp. Inst. xi. 1913, pp. 206–221.——"Apparent Kernel Shortage in the Opobo Districts," The Lagos Customs and Trade Journal, Feb. 17th, 1913, pp. 103–106.——"Report on the Relative Shortage of Palm Kernel Exports from the Eastern Province as compared with the Western and Central Provinces," Unwin, in The Nigerian Customs and Trade Journ. June 2nd, 1913, pp. 319–322.——"Palm Produce Industry," l.c. July 2nd, 1913, pp. 360–364; being a classified list of questions submitted by the Commercial Intelligence Officer to the District Commissioners throughout S. Nigeria and their Answers.——Palm Oil and Kernels Billows & Beckwith, pp. 1–108 (Charles Birchall, Ltd., Liverpool, 1913).——The Cultivation of the Oil Palm, Milligan, pp. 1–100 (Crosby, Lockwood & Son, London, 1914).——"Palm Nut Kernel Cake," Journ. Bd. Agric. Nov. 1914, pp. 697–701.——"Contributo alla Conoscenza della Palma a Olio," Beccari, in L'Agric. Coloniale (Firenze), viii. 1914, pp. 5–37; pp. 108–118; pp. 201–212; pp. 255–270; illustrated reprint, pp. 1–76 (Inst. Agric. Col. Ital., Firenze, 1914).——"The Varieties of Oil Palm in West Africa," Kew Bull. 1914, pp. 285–288.——Palm Kernels: Report of the Special Committee Appointed by the West African Section, London Chamber of Commerce, 18th Sept. 1914 to consider the Question of the Palm Kernels Industry as affected by the War, Philipps, in The Nigerian Customs and Trade Journ. April 17th, 1915, pp. 154–156. ——"Palm Nut Kernel Cake," Journ. Bd. Agric. Jan. 1916, pp. 998–1001.——"The Influence of Palm Kernel Cake on the Production of Milk and Butter," l.c. July 1916, pp. 305–320.——"Palm Kernels and Palm Kernel Cake," l.c. pp. 363–366.——"Palm Kernel Cake," l.c. Nov. 1916, pp. 734–749.——"Palm Kernel Cake and Meal as Food for Pigs," l.c. Dec. 1916, pp. 850–859.—— "*Elaeis guineensis*," in The Palms of British India and Ceylon, Indigenous and Introduced, Blatter, Journ. Bombay Nat. Hist. Soc. xxiv. June 1916, pp. 508–513.——"Investigation of the Oil Palm and Its Products: Tapping Oil Palms for Wine," Johnson, in Ann. Rep. Dept. Agric. S. Nigeria, 1917, pp. 8–13.——

"Coconut Cake and Palm Kernel Cake," Leaflet No. 20, 1917, Bd. of Agric.——"The West African Oil Palm," Kew Bull. 1918, pp. 121–124.——"The Oil Palm in the Cameroons," l.c. pp. 197–198.—"The African Oil Palm, Its Possibilities in Malaya," Eaton & Spring, in Agric. Bull. Fed. Malay States, vi. No. 11, Sept.–Oct. 1918, pp. 493–512.——"Recherches sur la Fabrication de l'huile de Palme Neutre," Ammann, in L'Agronomie Coloniale, No. 20, Sept.–Oct. 1918, pp. 33–41.——"Oil Palm," Bull. Imp. Inst. xvii. 1919, pp. 262–264.——"Die Schildkroten–Ölpalme," Bücher & Fickendey, in Der Tropenpflanzer, xxii. Aug. 1919, pp. 246–249.——"Die Ölpalme, Bücher & Fickendey, pp. 1–124, pls. i–xx (Berlin, 1919).——"The Oil Palm (*Elaeis guineensis*) in the East," Mathieu, in The Gardens Bull. Straits Settlements, ii. No. 7, April 12th, 1920, pp. 217–230.——"The West African Oil Palm," Kew Bull. 1920, pp. 119–205.——"Crop Records of Oil Palms," Rutgers, and "The Content of Free Fatty Acids in Palm Oil," van Heurn, in Communications, Exp. Station of the A.V.R.O.S., No. 8, 1920, pp. 1–47 (Batavia, 1920).——"Oil-Palm," Kirby, in Trade Suppl., Nigeria Gazette, Oct. 28th, 1920, pp. 218–220.——"The Cultivation of the African Oil Palm, East Indies," Bull. Imp. Inst. xviii. 1920, pp. 209–252.——"Belgian Experiment on Palm Oil as a Motor Fuel," Cross, in Commerce Rep. Washington, Jan. 3rd, 1921, pp. 10–11.

Cocos, Linn.

Cocos nucifera, *Linn.*; Fl. Trop. Afr. VIII. p. 126.

Ill.—Rheede, Hort. Mal. i. tt. 1–4; Rumpf. Amb. i. tt. 1–3, Roxb. Pl. Corom. t. 73; Jacq. Hist. Stirp. Am. t. 168; Gaertner Fruct. Sem. Pl. i. tt. 4, 5; Lam. Encycl. t. 894; Desc. Ant. i. t. 21; Dict. Sc. Nat. t. 118; Martius, Palm. ii. tt. 62, 75, 88, ff,3–6; Tuss. Ant. iv. t. 34; Spach, Suites (Hist. Nat. des Végétaux) t. 100; Gaudichaud, Voyage, Bonite, tt. 122–123 (Anat. Stem.); Hooker, Kew Journ. Bot. ii. 1850, t. 1; Wallace, Palms, Amazon, t. 48; Gard. Chron. July 30th, 1870, p. 1023, f. 192 (Syon House); Vidal, Fl. For. Filip. t. 94D; Zippel, Ausl. Handels Nährpfl. tt. 43, 44; Köhler, Med. Pflan. iii; Gartenfl. xlix. 1900, p. 637 (germ. seed); Tropenpfl. viii. 1904, tt. 5–8; Rev. Hort. Belge, xxxi. 1905, p. 32; Safford, Pl. Guam (Contr. U.S. Nat. Herb. ix. 1905) tt. 43, 44; Karst & Schenk, Veg. bild. iii. t. 48; Teysmannia, Batavia, xix. 1908, pp. 8, 10; Gard. Chron. May 2nd, 1908, p. 279 (var. *aurea*); Ann. Jard. Bot. Buitenzorg. Suppl. iii. part 2, 1910, p. 798; Gartenfl. lxv. 1916, pp. 262, 263; Journ. Bombay, N.H. Soc. xxiv. 1916, t. 86. (Grove on Bombay Island); Philippine Agric. Rev. xi. 1918, tt. 1–8; "Tropical Life," June 1921, p. 82 (Dwarf coconut).

Vernac. names.—Kwakwar Attagara (Hausa, *Dalziel*).—Coconut Palm.

Cultivated more or less in all tropical countries, near the sea.

In Southern Nigeria plantations are common on the sea coast and for a considerable distance inland; on the Western side, especially near Badagry, where copra is prepared for export (Col. Rep. Ann. No. 751, 1913, p. 14). In 1893 this neighbourhood was visited by the Curator (H. Millen) of the Botanic Station at Ebute Metta who reported "the first plantation visited was the Government plantation at Badagry situated close to the sea. Here a large area is devoted to the growing of coconuts; these trees are in two stages of growth, the larger ones are in a healthy condition, the younger ones are not established yet; attention is required to clean away the long growing grass which surrounds them" (Kew Bull. 1893, p. 182). In 1913 the Director of Agriculture reports "A great deal of the land in the neighbourhood of the Badagry Lagoon is admirably adapted for the cultivation of coconuts, and it should be possible to produce a large quantity of copra for export. It is proposed to establish a model coconut plot and nursery at Badagry; the plants raised in this nursery will be distributed to the chiefs of the villages situated alongside the lagoon and an agricultural officer will be sent to show them how they should be planted." He inspected a plantation owned by the Seriki—an influential chief of Badagry—in which some of the trees were 20 years old, raised from seed supplied by the Government (The Nigeria Gaz. Jan. 15th, 1914, p. 191).

Some coconuts from the Straits Settlements in Oct. 1906, planted in Nursery beds at James Town, were distributed in 1907, being then about 6 ft. high. One specimen plant was transferred to the Garden at Old Calabar where also the varieties "Kelapa payoh," Kelapa dadeh" and "Kelapa higan" were put in (Govt. Gaz. S. Nig. 28th Aug. 1907, Suppl.)

A few palms, some of them said to be 40 years old are growing at Ilorin in the Northern Provinces (Thornton, West India Comm. Circ. Nov. 17th, 1914, p. 550).

A specimen of copra from Southern Nigeria was equal in appearance to Ceylon Copra, worth £19 per ton (June 1910); but stated to yield an oil which was more acid than that from Ceylon (Col. Rep. Ann. No. 687, 1911, p. 29)., and copra prepared from four coconuts gathered at Aiere, near Kabba, weight about 3 lbs., yielded 67 per cent. of oil possessing the usual characters of coconut oil (N. Nigeria Gaz. Suppl. No. 10 of 1911, p. 284). A sample of coconut oil, submitted by the Provincial Commissioner at Old Calabar to the Imperial Institute in 1910, was described as "weight about 1 lb., white, solid crystalline fat having the characteristic odour of coconut oil: a small quantity of vegetable impurity was present. On melting the fat a faint burnt smell became apparent, if quite clean readily saleable at the current market price—£42 10*s*.–£45 per ton (April 1910)" (S. Nig. Govt. Gaz. Suppl. June 8th, 1910).

It would seem to be clear that in the products of this palm there is ample room for expansion in the trade from Nigeria, and the same might be said for the whole of Tropical Africa—

although flourishing and commonly met with in most districts, it is only from the Colony (Lagos) of the Southern Provinces, Nigeria, that copra is exported—to the value in 1918 of £9,278—and (as above mentioned) here in the Badagry district some of the chiefs and farmers have been encouraged to start plantations, 2300 seedlings in 1918 being distributed to them (Johnson, Ann. Rep. Agric. Dept. S. Prov. Nigeria, 1918, p. 21). The palm is found on the greater part of the coast-line of the Gold Coast, but not utilised generally for the preparation of copra—it is prepared to a small extent in the Kwitta district (Col. Rep. Ann. No. 751, 1913, p. 14). On the Gambia the palm is only met with at Bathurst (Kew Bull. 1892, p. 46)—though perhaps the climate in this colony is too dry for cultivation. Conditions are more advanced in the East Africa Protectorate, where in 1911–12 it was reported that " the export of copra still continues on a large scale and big areas are being planted out with young palms; France continues to be the largest single purchaser of East African copra, taking £24,677 worth or 88 per cent.(Col. Rep. l.c.). Copra from Cape Lopez, Gaboon, has been noted in Liverpool (Hillier, Kew Bull. 1913, p. 84), and in Zanzibar for copra the cultivation ranks in importance next to cloves (*Eugenia caryophyllata* ; *see* p. 318), 45,000 acres being estimated under coconuts in the two islands (Zanzibar and Pemba) in 1916 (Col. Rep. Ann. No. 925, 1917, p. 7).

The chief sources of copra are the South Sea Islands (shipped by way of Australia and New Zealand),Ceylon, Straits Settlements, and Federated Malay States, Philippine Islands and Guam, French Possessions in the Pacific, Dutch East Indies, Mauritius, Portuguese East Africa and Fiji Islands, from whence in 1913 a total of 691,433 centals was imported into the United Kingdom, in which year also approximately double this amount of oil, refined and unrefined came in from Germany, Denmark, Ceylon, Australia, France, Belgium, Holland, and the United States. Copra is stated to be the chief product of this palm shipped from Ceylon—nearly 21,000,000 tons in 1914 (Trop. Agric. March 1915; Agric. News Barbados, June 1915, p. 201)—this product for expression of the oil in pre-war days went chiefly to France and Germany, and in general it is submitted that the position of the oil-crushing industry at that time was much the same as that for " Palm Kernels " (*q.v.*).

Coco-nut oil is shipped in bulk from Java to the Pacific Coast of America in the double bottoms of cargo steamers, the difficulty of solidification in cooler climates being met by specially fitted steam coils (Agric. Bull. Fed. Malay States, March & April 1919; Agric. News, Barbados, Oct. 4th, 1919, p. 309). It is largely shipped from Cochin to Europe in large casks or pipes made of the wood of *Dysoxylum malabaricum*, Bedd. (*D. glandulosum*, Talbot), the " White Cedar " wood of Tavancore, a large tree of Malabar, etc., this wood is recommended because it does not discolour the oil nor permit of percolation through the pores;

the staves are dowelled with bamboo pegs and "flagged" or packed with plantain fibre (Cox, Indian Forester, xlvi. 1920, p. 65).

"Cocoa-nut butter" is an edible fat prepared from the kernel (copra) of the nut and refined oil or solid fat is very largely used in the preparations of margarine and other foodstuffs. The cake ("Poonac" in Ceylon) is an important cattle food [*see* Kew Bull. 1890, "Cocoa-nut Butter," pp. 230–238; Journ. Bd. Agric. June 1901, "Cocoa-nut Butter," pp. 101–102; Feb. 1915, "Cocoa-nut Cake," pp. 1025–1032 (and in Special Leaflet No. 20, 1917); May 1916, "Feeding Cocoa-nut Cake on Grass," pp. 117–123]. Desiccated cocoa-nut and coir-fibre from the husk of the nut are important articles of trade, the former used for confectionery and culinary purposes and the latter for the manufacture of mats, bags, brushes, ropes and cordage. The fibre dust is used largely in Europe for horticultural purposes; and it is of some value as a fertiliser. Coir fibre from Lagos was sent by the Colonial Office to Kew early in 1889; it was submitted to brokers in London, who reported on the samples—"These contain soft half-prepared bristle fibre, used in the manufacture of brushes mixed with short or mat fibre: we value the bristle portion at £15 and the mat portion at £9–£10 per ton." "This fibre would find a ready sale here both for brush and mat making purposes: but the two sorts should be kept separate" (Kew Bull. 1889, pp. 129–132). The oil in addition to the use mentioned above is also of importance in soap and candle manufacture and as an illuminant in many countries of production where to the native the palm is invaluable, the various parts each finding some use—food and drink in the nut, leaves for thatching, trunk for building, sap—"toddy" (India) or "tuba" (Philippines) from the inflorescence (*see* also under *Borassus*) and in general supplying a variety of domestic wants. In both India and the Philippines the extraction of sap for the distillation of spirit or "arrack" is of some importance (Kew Bull. 1912, p. 124). It will be obvious, however, that the palm cannot be grown for copra, coir and the production of spirit at the same time.

The cultivation, although requiring some skill and experience, is comparatively easy. The palm is propagated by means of the whole nut or fruit. It is recommended that the nuts for planting be carefully selected form vigorous trees well known to produce a free supply of nuts with a high percentage of kernel for oil or of husk for coir fibre.

"The selection of coco-nuts for planting" has been discussed in the Kew Bulletin (1915, pp. 72–76) and it is at present open to question whether nuts from young trees may be used or that plants should only be raised from fully matured trees; but the experience so far gained on plantations in the West Indies seems to be in favour of either. Ceylon nuts are larger and stated to yield twice as much copra as the Seychelles nuts but the

thickness of the meat (copra) has been found to be the same in both cases), the difference being considered entirely due to selection—" to increase the size of the nuts " and " to reduce the percentage of the envelopes "—the trees from which this conclusion was drawn were grown in the same soil and climate of the Seychelles (Ann. Rep. Bot. Station, Seychelles, 1904: Agric. News Barbados, April 14th, 1906, p. 127).

The plants are usually raised in Nurseries, the nuts being placed on their sides—in an experiment 92 per cent. of nuts germinated thus: but only 60 per cent. out of nuts placed standing up on end (Kew. Bull. 1915, p. 75)—about 18 in. apart and deep enough to cover about two-thirds or so of the nut in the soil. It is recommended to keep the nuts for about a month in a dry airy place before planting. Germination takes from 4–5 months and the young plants may be planted out in the plantation at distances of about 25–30 ft. when they have developed 3 or 4 leaves.

Green manuring and cover crops such as *Canavalia ensiformis* (*see* p. 221), *Tephrosia purpurea* (*see* p. 195) and other leguminous plants (p. 179) are recommended. " Ground Nut " (*Arachis hypogaea*) is a good catch-crop in the early years of the plantation as well as for green manuring (*see* p. 201).

A tropical climate with a good rainfall, a rich, deep, well-drained calcareous soil near the sea are conditions favourable to good growth; although considering the wide distribution the best soil is open to question and may vary considerably. It may also be difficult to say without reserve if the tree is essentially a halophyte, the probability is that it is not, seeing that it does not thrive in swamps and has been found to do well in situations distinctly free from the influence of salt. " Extends up the Niger to Idda, where it fruits at 120 miles from the sea," and " I have two young trees at Lukoja more than 150 miles from the nearest salt water " (Baikie at Bida, Feb. 18th, 1862—l.c. p. 105). Ilorin mentioned above is 250 miles from the coast and over 1000 ft. above sea level; some of the trees referred to were stated to be bearing quite good crops of nuts; the soil was described as an ideal coco-nut soil, light and sandy, almost as sandy as the sea shore and the land undulating, covered with grass, with here and there a tree giving it the appearance of park-land. Plantations in Nevis, West Indies, where palms in their third year have been found to yield full-sized nuts and good crops in 5 years are on old sugar cane land which is almost at sea-level, soil a nice loam gradually getting lighter until it becomes pure sand on the sea-shore (Kew Bull. 1915, p. 75). Trees begin to yield in paying quantities when about 5–8 years old. Some experience is required to know just when the nuts are ripe enough to gather; they usually fall when sufficiently mature; but in practice this cannot always be waited for—harvesting being done at least 3 or 4 times a year—and native labourers climb the trees to cut them down—about 400–500 nuts

a day being the average for one man in Malaya (Coghlan, "Coco-nut Industry in Malaya," p. 30) or 1000 in the West Indies (l.c.) An average yield may be taken as from 40–50 nuts per tree per annum. As showing the progress that might be expected in a plantation the experience on the estate at Nevis above referred to shows, briefly, began in the autumn of 1907, number of nuts planted up to the end of 1911 amounted to 10,305—28 ft. apart or 52 to the acre; certain trees commenced to bear in 1911, and in greater quantity in 1913 when the 1907 plants were 5¼ years old. From January 11th, 1913, to June 30th, 1914, the number of nuts harvested was 23,807. From January 11th to October 23rd a 4 in. gauge was used giving 77·4 per cent. of selects and 22·6 per cent. of culls—both selects and culls sent to New York where the market took both grades as select, paying $42.50 for 1000, about the highest price paid for coconuts in that city—from October 23rd a 3⅞ in. gauge (⅛ in. larger than the Malay regulation gauge of 3¾ in.) and of 75,116 nuts gathered, 68,419 or 91·08 per cent. were "select" [above 3⅞ in.] and 6,697 or 8·92 per cent. were "culls" [less than 3⅞ in. on the New York market]. A selection made in the field of the nuts while in the husk has been found to give 95–98 per cent. over the 3⅞ in. gauge when husked (Kew Bull. 1915, p. 75). In Malaya the generally adopted estimate is given on the average as 10 nuts per tree per annum at the end of the 6th year, 30—7th year, 40—8th year and 50—succeeding years (Coghlan, l.c. p. 32). The standard number of nuts to a ton is 4000 (l.c.). In Malaya there is also a dwarf variety "Nyiurgading," remarkable for its early fruiting, in from 3–4 years, height 10 ft., and accordingly convenient for planting about 90 to the acre; but the nuts are smaller than the ordinary, making the yield approximately the same (*see* Agric. Bull. Fed. Malay States, Sept.-Oct. 1919, pp. 295–297). There are also several varieties and many forms in various parts of the world, the yields of which may vary in proportion to their individual characters. The "Copra" may be sun-dried, smoke-dried or prepared in special dryers. "After the removal of the fibre the nuts are split across the middle with a strong knife; the 'milk' is emptied out and the half nuts are exposed to the sun for some days to dry; during the drying the kernel shrinks from the shell and the half-kernels are then removed from each half nut; these half-kernels are then spread out in the sun in single layers and turned over frequently until they are completely dry" (N. Nig. Gaz. Suppl. No. 10, 1911, p. 284). It is important that the dried produce be kept free from moulds.

The oil is expressed by special machinery and that which is prepared in this country is known as "Copra Oil." The percentage of oil yielded varies from 30–70 according to the amount of drying the kernel has undergone. "Two hundred pounds of copra should produce approximately 124 lb. of oil and 74 lb. of cake" (U.S. Mon. Cons. Rep. Aug. 1904; Agric. News,

Barbados, Jan. 14th, 1905, p. 6). In Trinidad it has been found that 275 to 300 nuts give 100 lb. of copra or 5–6 gallons of oil; returns vary on each estate according to the quality of the nuts produced and to the machinery employed (Journ. Bd. Agric. B. Guiana, April 1912, p. 207).

In the preparation of "coir" or fibre the outer layer or husks of the fruits are first retted in tanks of water for about two days; they are then split into 4 or 5 pieces and the fibres are combed, washed and dried in the sun. When dry the fibres are separated by further combing and graded into equal lengths—the long straight fibres for brushmaking and the towselled combings for mat-making; packed separately in bales of 1–2 cwt. each (Kew Bull. 1889, p. 132)—for export "The annual yield of 'coir' fibre from one tree is given at from 5–6 lb., average price (1912) about 12*s.* 4*d.* per cwt." (Agric. News Barbados, March 2nd, 1912, p. 68)—value (1920) for Cochin 25*s.*–56*s.*, and Ceylon 27*s.*–33*s.* per cwt. (Mon. Circ. Ide Christie, 15th Jan. 1920)—or "the husk from 1000 nuts weighing 1700 lb. gives approximately 400 lb. of fibre of all grades. In some factories where fibres are specially selected and treated to provide the "horse-hair" substitute, the fibre obtained from the same weight of husk is about 300 lb. The residuary dust, when dry, weighs about half a ton. An approximate estimate of the net profit obtained from the fibre and residue of 1000 nuts may be put in round figures at £1 (Coghlan, l.c. p. 35).

In Trinidad—where there were three coconut-fibre factories, in 1919 with a total capacity of 480 long tons—the preparation of coir fibre, described by Mr. W. G. Freeman, is that "the husks are first battened down in concrete tanks and soaked in water for about 5 days after which they are passed through a crusher composed of a pair of cogged rollers pressed together by heavy springs. The cleaning mill consists of a rotating drum about 30 in. in diameter, fitted on the periphery with steel spikes. In front of this drum there is a pair of small feed rollers through which the husk is fed and held against the rotating teeth. The husk is passed through these rollers as far as possible without letting go of it. It is then drawn back and turned end for end. After that it is turned over and the operation is repeated. The long-staple fibre, generally known as the brush fibre, remains in the operator's hands and the short-staple fibre, known as mattress fibre is drawn into the machine. So far as the long-staple fibre is concerned it is now finished except for drying. The mattress fibre, containing all the refuse, is taken from under the cleaning mills and put into the willowing machine, which is an inclined revolving drum covered with ½-in. wire mesh and containing revolving beater drums mounted on a shaft which rotates in the opposite direction to the drum. The fibre is then spread out in the sun to dry which in fair weather can be done in a day. Finally it is hydraulically pressed into bales,

measuring 20 by 20 by 40 in. and weighing about 180 pounds" (Commerce Rep. Washington, No. 250, Oct. 24th, 1919).

Fuller information will be found on reference to the following works.

Ref.—The Prince of Palms (*Cocos nucifera*), Treloar, pp. 1–50 (Sampson Low, Marston, &c. London, 1884).——All about the Coco Nut Palm, Ferguson, pp. 1–235 (Ferguson, Colombo, 1885: 3rd ed. 1904).——A Monograph on the Cocoanut Palm or *Cocos nucifera*, Shortt, pp. 1–22, Pls. i–x. (Govt. Press, Madras, 1888). ——"*Cocos nucifera*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 415–459.——"Copra (Solomon Islands)," Kew Bull. 1897, pp. 416–417.——"The Origin and Distribution of the Cocoa Palm," Cook, in Contr. U.S. Nat. Herb. vii. 1901, No. 2, pp. 257–293.——"Imperfect Coco-Nuts," Bull. Bot. Dept. Jamaica, viii. July 1901, pp. 104–106, with figs. of normal and sterile fruit.——"Le Cocotier," (Les Cultures de l'Archipel des Comores) Lafont, in L'Agric. prat. pays chauds, ii. 1902–03, pp. 337–353.——"*Cocos nucifera*—"Coco-Nut," in Useful Pl. Guam, Safford (Contr. U.S. Nat. Herb. ix. 1905), pp. 233–243.——"The Coco-Nut Palm and Its Products," Bull. Imp. Inst. iii. 1905, pp. 211–217.——Le Cocotier, Hubert, pp. 1–133 (Dunod & Pinat, Paris, 1906).——Le Cocotier: Culture, Industrie et Commerce dans les Principaux Pays de Production, Prudhomme, pp. 1–491 (Aug. Challamel, Paris, 1906).——"The Soil in Coco Nut Cultivation," Bull. Misc. Inf. Roy. Bot. Gdns. Trinidad, Jan. 1908, pp. 21–24; from Trop. Agric. (Ceylon) July 1907 and Journ. D'Agric. Tropicale (Paris) April 1907.——"*Cocos nucifera*," in The Commercial Products of India, Watt, pp. 349–363 (John Murray, London, 1908.——"Hints on Coconut Cultivation," Benson, in Philippine Agric. Review, ii. Oct. 1909, pp. 575–576.——"The History of the Coconut Palm in America," Cook, in Contr. U.S. Nat. Herb. xiv. part 2, 1910, pp. 271–342, illustrated.——"Note sur la Culture du Palmier Cocotier," in Bull. Agric. Congo Belge, i. Dec. 1910, pp. 227–236.——"Coconut Water" Col. Rep. Misc. No. 71, 1910, pp. 238–240.——"Cocos nucifera," in The Alcohol Industry of the Philippine Islands," Gibbs, in The Philippine Journ. Science (Chemical Series) vi. June 1911, pp. 147–167; Commercial Importance, Distribution, Uses, The Sap, Tapping, Yield, Composition, Utilization, Costs, Source of Sugar and Vinegar.——Coconut Cultivation, Brown, Dept. Agric. Fed. Malay States, Bull. No. 11, 1911, pp. 1–16; reprint in Bull. No. 69, Dec. 1911, Dept. Agric. Trinidad & Tobago, pp. 186–191.——"Die Kulture der Kokos-palme," Zaepernick, in Der Tropenpflanzer, Biehefte, xii. No. 6, Oct. 1911, pp. 509–611.——Die Kökospalme und ihre Kultur, Preuss, pp. 1–200, illustrated (Imp. D. Reimer (Ernest Vohsen), Berlin, 1911).——"Coco-Nut Culture," Fredholm, in West India Committee Circular, Aug. 27th, 1912, p. 411 and in each issue (fortnightly) up to and including March 11th, 1913, p. 106.——Cocoanut Culture, Barrett, Farmer's Bull.

No. 17, 1911, Philippine Islands, Dept. of Public Inst. Bur. Agric. Manila.——"The Cultivation of Coconuts in British Guiana," Harrison & Stockdale, in Journ. Bd. of Agric. B. Guiana, v. April 1912, pp. 200–211.——"The Coconut and Its Commercial Uses," in Bull. Imp. Inst. x. 1912, pp. 76–94, pp. 264–281.——"Cocoa Nuts," Kew Bull. 1912, p. 182.——"Soils and Locations for Coconut Plantations," Barrett, in Philippine Agric. Rev. v. 1912, pp. 246–250.——"Cover and Secondary Crops in the Coco-nut Plantation," Barrett & Wester, in Philippine Agric. Rev. v. 1912, pp. 270–272; "Varieties of Coconuts," Barrett, l.c. pp. 251–253.——"Harvesting Notes for Coconut Planters," Barrett, l.c. pp. 273–274; "The Coir Industry," Saleeby, l.c. pp. 275–280; "Copra Machinery," l.c. pp. 284–286.——"The Coconut and Its Cultivation and Uses," Bull. Bur. Agric. Inst. Rome, iii. 1912, pp. 2003–2012.——"Note on the Copra Itch," Aldo, & "Report on the Mite causing Copra Itch," Hirst, in Journ. Trop. Medicine & Hygiene, xv. Dec. 16, 1912, pp. 374–375, Note in Bull. Bur. Agric. Inst. Rome, iv. 1913, pp. 181–182.——"The Cost of Making Copra," Brown, in "Tropical Life," Sept. 1913, p. 165.——"Coco Nuts: Their Yield and Value per Palm," l.c. p. 173.——"Copra Spoilage on a Large Scale," Pratt, in The Philippine Journ. Science (Chemical Series), viii. No. 6, Dec. 1913, pp. 439–441.——"Copra," in Col. Rep. Misc. No. 88, 1914, pp. 536–537; "Coconut Oil," l.c. pp. 537–538—S. Nigeria, Ceylon and West Indies.——"The Industrial Position of Copra, Coconut Oil and Coconut Cake," Bull. Imp. Inst. xii. 1914, pp. 557–577.——"Coconut Cultivation and Plantation Machinery," Coghlan & Hinchley, pp. 1–128 (Crosby, Lockwood & Son, London, 1914).——Note sur la Culture du Cocotier," Drousie, in Bull. Agric. Congo Belge, v. Mars 1914, pp. 30–46, illust.——Coco Nuts: The Consols of the East, Hamel Smith & Pape, pp. 1–664, and i–lxviii. ("Tropical Life" Pub. Dept. London, 1914).——Coconut Industry in Malaya, Coghlan, pp. 9–42 (Malay States Inf. Agency, London, 1914).——"Selection of Coco-Nuts for Planting" in Kew Bull. 1915, pp. 72–76: Abstract in Agric. News, Barbados, xiv. May 8th, 1915, p. 149.——"The Copra Industry of the Pacific Islands and the War," in Bull. Imp. Inst. xiii. 1915, pp. 639–640.——"Copra from Queensland," l.c. pp. 550–552.——Coconut Experiments, Knowles, Dept. Agric. Fiji, Bull. No. 8, 1915, pp. 1–6; pls. i.–iv.——A Practical Guide to Coco-Nut Planting, Munro & Brown, pp. 1–186, illustrated (John Bale, Sons & Danielsson, Ltd. London, 1916).——"*Cocos nucifera*," The Palms of British India and Ceylon, Blatter, in Journ. Bombay Nat. Hist. Soc. xxiv. 1916, pp. 518–535.——The Coco Nut, Copeland, pp. 1–206 (Macmillan & Co. Ltd. London, 1916).——"Copra," in Bull. Imp. Inst. xiv. 1916, pp. 220–221.——The Study of Copra and other Coconut Products, Cox, in The Philippine Journ. Science (Sect. A Chem. & Geol.) xii. No. 2, 1917, pp. 49–53: "Copra and Coconut Oil," Brill, Parker & Yates, l.c. pp. 55–110.——The Coconut: Its Culture and Uses,

Wester, in The Philippine Agric. Review, xi. 1918, pp. 1–60, illustrated.——" Races of the Coconut Palm, in The Gardens Bull. Straits Settlements, ii. Sept. 12th, 1919, pp. 143–145; from Philippine Agric. Rev. l.c. illustrated.——" The Dwarf Coconut," Handover, in Agric. Bull. Fed. Malay States, No. 5, Sept.–Oct. 1919, pp. 295–297; abstract in Kew Bull. 1920, pp. 255–256.——*Cocos nucifera*: Handboek voor de Kennis van den Cocos-Palm in Nederlandschindie, Zijne Geschiedenis, Beschrijving, Culture en Producten, Hunger, pp. 1–518, illustr. (Scheltema & Holkemas Boekhandel K. Groesbeek & Paul Nijhoff, 1920).

PANDANEAE.

Pandanus, Linn.

Pandanus Candelabrum, *Beauv.*; Fl. Trop. Afr. VIII. p. 132.

Ill.—Gaudichaud, Voyage Bonite, t. 26, ff. 10–20 (*Tuckeya candelabrum*); Palisot de Beauv. Fl. Oware & Benin, i. tt. 21–22; Thonner, Blütenpfl. Afr. t. 3.

Niger, Cameroons. A branched tree, developing aerial roots near the base.

Pandanus Heudelotianus, *Balf.*, *f.*, Fl. Trop. Afr. VIII. p. 131.

Ill.—Gaudichaud, Voyage Bonite, t. 25, ff. 15–31 (*Heterostigma Heudelotianum*), Journ. Bot. 1894, t. 347, ff. 5–6.

Senegambia, Nigeria.

Fibre from the pendulous shoots of a *Pandanus*, probably this species from the Northern Provinces, reported on as of good quality (Col. Rep. Ann. No. 816, 1914, p. 23). Mats are made of the leaves of *Pandanus* in the Cross River region—the spines are first removed and the leaves dried in the sun for about a week, after which they are split into strips and woven by hand (Holland, Mus. Kew, 1899), and " Vacoa " sacks are made of *Pandanus* leaves in Reunion, chiefly for export to France, 456,000 sacks, average price 13 fr. 75 c. (11*s.*) per 100, being exported during 1914 (Cons. Rep. No. 5530, 1915, p. 7).

TYPHACEAE.

Typha, Linn.

Typha australis, *Schumach.* & *Thonn.*; Fl. Trop. Afr. VIII. p. 135.

Ill.—Verhandl. Zool.—Bot. Gesell. Wien, 1889, t. 5. f. 4 (*T. acquinoctalis*); Webb & Berth. Iles Canaries, Phyt. iii. t. 218 (*T. macranthelia*)

Vernac names—Shalla (Kano, *Dalziel*); Salla (Sokoto, *Dalziel*); Maruru (Manganja Hills, *Meller*).

Lagos (Barter, No. 3240, Herb. Kew); Sokoto Province, Bornu, Kano (Dalziel, Herb Kew) and found on the Gold Coast, in Nile Land, Lower Guinea, Mozambique District and South Africa.

Leaves used by native coopers when putting palm-oil casks together, Lagos (Barter, l.c.); stems used for screens called "fedda"; the soft core of the immature flowering head edible, Kano (Dalziel, Hausa Bot. Voc. p. 87); rushes from the ashes of which native salt is made, Manganja Hills, Lake Shirwa, Mozambique District (Meller, l.c.). The plant forms part of the "Sudd" of the River Nile—*see* under *Cyperus Papyrus.*

Plant attaining 5–6 ft. in height. A tall water reed 10–12 ft., very abundant in marshes from Sokoto to Bornu (Dalziel, Herb. Kew); growing with *Papyrus*, abundant in many parts of the Crado Lake, Lagos (Barter, l.c.), abundant by Lake Shirwa (Melles, l.c.), in swamp on Mt. Marisu Plateau, B.C. Africa (McClounie, Herb. Kew).

AROIDEAE.

PISTIA, Linn.

Pistia Stratiotes, *Linn.*; Fl. Trop. Afr. VIII. p. 140.

Ill.—Sloane, Hist. Jamaica, i. t. 2, f. 2 (*Lenticula palustris*); Rumpf, Amb. vi. t. 74, f. 2; Rheede, Hort. Mal. xi. t. 32; Lam. Encycl. t. 733; Dict. Sc. Nat. tt. 7–8; Roxb. Fl. Corom. iii. t. 268; Desc. Ant. vii. t. 490; Griffith, Ic. Pl. Asiatic, tt. 161*a*, 161*b*; Martius, Fl. Bras. iii. pt. 2, t. 52; Bot. Mag. tt. 4564; Lemaire, Le Jard. Fl. t. 137; Fl. des Serres, vi. 1850–51, t. 625; Engler & Prantl, Pflan. ii. pt. 3, p. 152, f. 100; Baillon, Hist. Pl. xiii. p. 449, ff. 323–327.

Vernac. names.—Kai nuwa (Hausa, *Dalziel*); Eye-pity (Gambia, *Brown Lester*); Pana (Bengal, *Watson*); Quiapo (Manila, *Merrill*); Water Lettuce, Water Soldier (Ashanti, *Chipp*).

Nupe (Barter), River Niger (Barter), Engenni River, Cross River (Holland), Cameroons, Lake Chad (Vogel, 41 Herb. Kew), Nile Land, Lower Guinea, Mozambique, and widely distributed in fresh water rivers and pools in the Tropics.

Used by the Natives of the Gambia as an anodyne eye-wash: the leaves are soaked in cold water. If the plant comes in contact with the body it produces a sharp stinging sensation, like a nettle sting, and the pain continues for some minutes (Kew Bull. 1891, p. 275). The ashes—"Pana Salt" are applied to ringworm of the scalp in some parts of India (Dymock Pharm. Ind. iii., p. 550).

Cultivated by the Chinese in Malaya (Ridley, Journ. Bot. xl. 1902, p. 34) and in Borneo (Beccari, Wand. Gt. Forests, Borneo, p. 17) for feeding pigs. Beccari states—"I often admired the splendid pigs bred by Chinese, who certainly excel in the art of fattening these animals; amongst other food they give them an aquatic plant, the so-called water lettuce, grown purposely in swamps and pools, and boiled."

In Antigua, Browne (Hist. Jamaica, p. 330) described it as "most abundant in all the ponds of water preserved for public use and keeps the water always fresh and cool, which would be

greatly subject to putrefaction and charged with a multitude of insects had they continued exposed to the heat of the sun; the plant, however, is there considered acrid, and when the droughts set in and the waters are reduced very low, they are overheated and so impregnated with the particles of this vegetable that they occasion bloody fluxes to such as are obliged to use them at those seasons" (Bot. Mag. l.c.).

Propagated by stolons or runners and will not grow except in fresh water: seen at its best in rivers free from tidal influence. The writer saw a close-growing mass of it under conditions similar to those described above, in the dry season in a backwater near the Cross River, and at its best floating down the Engenni River, where in a large pot in which water was collected from a native hut a fine lot of it was also seen. On trying to convey a few plants to grow at Old Calabar they seemed to go off by the time the mouth of the Bonny river was reached and did not recover sufficiently to grow.

ANCHOMANES, Schott.

Anchomanes Dalzielii, *N.E.Br.*; Kew Bull. 1913, p. 305.

Root tuberous; stem tall, prickly; leaves large, branching into three with petioles 2-3 ft. Spathe white.

Vernac. name.—Tsakara (Hausa, *Dalziel*).

Kontagora, Abinsi (Dalziel, Nos. 563, 862, Herb. Kew).

Tuberous root sometimes eaten in times when food is scarce after prolonged boiling to remove the acridity (l.c. and in Hausa Bot. Soc. p. 94).

Commonly found under the shade of large trees and in ravines.

Anchomanes dubius, *Schott*; Fl. Trop. Afr. VIII. p. 163.

Ill.—Gard. Chron. xxiii. May 23rd, 1885, p. 668, f. 151 (female fl.), 669, f. 152; Sem. Hort. 13th Oct. 1900, p. 473, f. 158 (*Cyrtosperma congoensis*).

Nupe, Oware, Old Calabar and Oban in Nigeria, in Ashanti, Gold Coast.

Tuber said to be edible, Ashanti (Cummins, Herb. Kew).

COLOCASIA, Schott.

Colocasia Antiquorum, *Schott*; Fl. Trop. Afr. VIII. p. 164.

Ill.—Sloane, Hist. Jamaica, i. t. 106 (*Arum esculentum*); Rumpf, Amb. v. t. 109, 110, f. 1 (*Arum aegyptiacum*); Rheede, Hort. Mal. xi. t. 22; Catesby, Nat. Hist. Carolina, Florida & Bahama Is. ii. t. 45 (*Arum Colocasia*); Wight, Ic. Pl. Ind. Or. iii. t. 786, f. 1; Schott. Gen. Aroid. t. 37; Ann. Sc. Nat. Paris, Series 4, xii. tt. 17–20 (Anatomie); Bot. Mag. Japan, viii. 1894, t. 4; Bot. Mag. t. 7364, t. 7732 (var. *Fontanesii*); Duthie, Field Crops, t. 75; Nicholls, Trop. Agric. p. 291 (*C. esculenta*); Johnston, Uganda, ii. p. 577 (*Collocasia Arum*); Agric. News, Barbados, ii. 1903, p. 358 (*C. esculenta*); Tropenpfl. Beih. v. 1904,

t. 17 (taro field); Bull. Econ. Indo-Chine, viii. 1905, pp. 1193–96 (*esculenta*); Karsten & Schenck, Veg. bild. viii. t. 43; Journ. & Proc. Asiatic Soc. Bengal, ix. 1913, t. 17; Bol. Agric. Sao Paulo No. 7, 1915, p. 595.

Vernac. names.—Kamu (Hausa, *Dudgeon*); Gwaza (Hausa, *Dalziel*); Koko (Yoruba, *Dalziel*); Taro (Polynesia); Dasheen, Eddoes (West Indies); Mankani (Accra, Fanti, *Easmon*); Yautia Malanga (Porto Rico, *Cook & Collins*); Gabis (Philippines, *Abadilla*).

Coco Yam, China Potato, Carib Cabbage (Sth. Carolina), Egyptian Arum (*Watt*), Scratch Coco (*Watt*).

Tropical Africa, Asia, Malay Archipelago, Pacific Islands, Tropical America, West Indies, under cultivation.

The tuberous roots are used everywhere as food, but "all parts are utilised after being well boiled to separate the acrid matter common to most Aroids" (Bot. Mag. l.c.). The young leaves and the stalks are eaten like Spinach, Gold Coast (Easmon, Col. Rep. Misc. No. 1, 1891, p. 35), in Dominica (Jones, Ann. Rep. Agric. Dept. 1917–18, p. 5), and in India (Watt, Comm. Prod. India, p. 398). The blanched shoots are also used as a vegetable in the United States (Year Book, U.S. Dept. Agric. 1916, p. 205; Agric. New Barbados, xvii. April 20th, 1918, p. 121) and in Dominica (Jones, l.c.).

Under cultivation there are many varieties, especially in the West Indies. The main conditions are a hot climate with a good rainfall. In Northern Nigeria it is rarely grown by the Hausas. "A few plants may be seen in the wet localities and near Zaria, where they are planted in swamps upon high mounds or ridges (Dudgeon, Agric. & For. Prod. W. Africa, p. 153); grown in low-lying meadows, in marshes and near streams. Kontagora (Dalziel, Bull. Imp. Inst. 1907, p. 260); more commonly grown in the Southern Provinces. The tubers are planted about 3 ft. apart, usually on mounds. The plants come to maturity in about 6–8 months, and the yield may vary from 5000–13,000 pounds per acre. In Florida "Dasheens" planted on hummock land in March are harvested in October or November; a hill of the "Trinidad Dasheen" grown from a single tuber at 6 months after planting was 5½ ft. high with a spread of more than a square yard, and one such hill in good rich soil would produce 4–10 lb. or more of tubers (Young, U.S. Dept. Agric. Bur. Pl. Industry, Circ. Dec. 5, 1914). When grown for shoots the method in the West Indies is to plant corms—2 to 3 lb. in weight in very moist sand or sandy soil, leaving the bud exposed and keeping in total darkness during the whole period of growth. The first crop of shoots (6–12 in. long) is usually ready for cutting in 35–40 days after planting; they are cut close to the corm and before the leaves begin to expand; from 6–10 cuttings may be made at intervals of from 10–14 days and when exhausted the plants are discarded and replaced by fresh corms (Agric. News, Barbados, April 20th, 1918, p. 121).

Xanthosoma sagittifolium, Schott, the "Yautia" of Porto Rico, the "Tania" or "Tannier" of the West Indies is also cultivated in the same way and for the same purposes as the above species, in Tropical America, West Indies &c., but the writer has no record of its cultivation in Nigeria.

It is, however, advisable to mention this plant here as in view of the confusion that appears to exist more or less widely in "Tannias" and "Eddoes," the literature has become considerably involved. *Colocasia* has a peltate leaf and *Xanthosoma* a sagittate leaf. *X. Mafaffa*, Schott, is stated to be cultivated on a small scale in Nigeria, the Congo, Dahomey, Liberia and French Guinea, and on a large scale on the Gold Coast and Ivory Coast (Chevalier, Bull. Soc. Nat. d'Accl. 1912, p. 345).

Ref.—"The Tania, *Colocasia esculenta*," in Trop. Agric. Nicholls, pp. 290–293 (Macmillan & Co., London, 1892).——"Tania: The Oldest Crop," Barrett, in Bull. Dept. Agric. Jamaica, iv. 1906, pp. 180–182: extract "What are Tannias," in Queensland Agric. Journ. xvii. Nov. 1906, p. 259.——"Fecule de *Colocasia Antiquorum*" in Étude de Quelques Fécules Coloniales, Planchon & Juillet, in Ann. Mus. Col. Marseille, vii. 1909, pp. 524-526.——Promising Root Crops for the South; Yautias, Taros and Dasheens, Barrett, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 164, 1910, pp. 1–29.——Agricultural History and Utility of the Cultivated Aroids, Cook, l.c. pp. 31–37, illustrated.——"Notes on the Pollination of *Colocasia Antiquorum*," Cleghorn, in Journ. & Proc. Asiatic Soc. Bengal, ix. Aug. & Sept., 1913, pp. 313–315.——The Dasheen: A Root Crop for the South, Young, U.S. Dept. Agric. Bur. Pl. Industry, Circ. issued Dec. 5th, 1914.——"Tanias or Dasheens," Harrison, in Queensland Agric. Journ. ii. July 1914, pp. 10-12, illustrated.——"The Dasheen: Its Uses and Culture," Young, in Yearbook, Dept. Agric. United States, 1916, pp. 199–208, illustrated; reproduced in Bull. Dept. of Agric. Trinidad, 1918, part 1, pp. 29–39.——"The Uses of Dasheens, Tannias and Eddoes," Agric. News, Barbados, xvi. Dec. 15th, 1917, p. 398.——"Yautia and Gabi Tests," Abadilla, in The Philippine Agric. and Forester, Nov. 1917, pp. 45–54; abstract in Agric. News, Barbados, xvii. March 23rd, 1918, p. 87.——"Some Root-Crops (Araceae)," Trop. Agric. xlviii. May 1917, pp. 331–333; "Dasheens," "Gabis" and "Yautias."——"Forcing and Blanching of Dasheen Shoots," Agric. News, Barbados, xvii. April 20th, 1918, p. 121.

Caladium, Vent.

Caladium bicolor, *Vent.*; Fl. Trop. Afr. VIII. p. 166.

Ill.—Jacq. Hort. Schoenbr. ii. t. 186 (*Arum bicolor*); Ventenat, Descr. Pl. Nouv. Jardin de Cels, t. 30; Bot. Mag. t. 820 (*Arum bicolor*); Lodd. Bot. Cab. t. 255; Hooker, Exotic Flora, i. t. 26; Bot. Mag. t. 2543; Drapiez, Herb. Amat. de Fleurs, iv. t. 297; Fl. des Serres, tt. 1346–47 (*C. Chantinii*), tt. 1348–49 (*C. Neu-*

mannii); Bot. Mag. t. 5199 (var. *Neumannii*), t. 5255 (var. *Chantinii*), t. 5263 (var. *Verchaffelti*); Nooten, Fl. Java, t. 15; Belgique Hortic. 1870, t. 17 (vars.); Gartenfl. xxxvii. 1888, t. 1269.

Old Calabar; and in other parts of West Africa, including Island of St. Thomas and Princes Island.

A decorative plant from which many handsome varieties have been raised, remarkable for the interchanging form of the two original colours red and white in the leaf. Tubers perennial; poisonous. In La Belgique Hort. xxix. 1879, "Toxicité du *Caladium bicolor*," p. 299, it is stated, "Il paraît que cette plante qui est généralement cultivée est un des plus grands poisons du règne végétal."

Commonly grown in gardens at home in open rich soil.

Native country not known, it was brought to this country from Madeira, where it is cultivated on account of the beauty of its leaves which grow there to a large size (Bot. Mag. t. 2543); said in Hortus Kewensis to have been introduced by Messrs. Lee & Kennedy, Nurserymen at Hammersmith in the year 1773 and flowered in the gardens of Mr. Fonnereau at East Sheen in 1778 (l.c. t. 820).

Common in all the cultivated ravines, Princes Island (Barter, Herb. Kew).

MONSTERA, Adams.

Monstera deliciosa, *Liebm.* in Kjoeb. Vidensk. Meddel. (1849) p. 19.

A climbing plant 20–30 ft. high. Roots aerial. Leaves 1–2 ft. across, leathery, perforated, petioles long. Fruit 6–8 in. long, cone-like, succulent.

Ill.—Gard. Chron. Dec. 4th, 1858, p. 883; Oct. 8th, 1864, p. 962; Fl. & Pom. April 1872, p. 77 (*Philodendron pertusum*); Nicholson, Dict. Gard. ii. p. 380, f. 585; Preuss, Expedit. Cent. und Südamer. p. 159 (in fruit Castleton Garden, Jamaica); Rev. Hort. Belge, 1904, p. 125; Bailey, Cycl. Hort. iv. p. 2063, f. 2385.

Native of Mexico, Cultivated in Botanic Gardens, Old Calabar and in Trinidad and most of the Botanic Gardens in the West Indies.

Fruit edible—the parts, "easily separable from a soft vinous very fragrant pulp which lies beneath them, are the heads of so many ovaries; when they are removed the lower part of the ovaries, which is the part eaten, can be readily detached from the somewhat woody axis over which they stand in the closest possible order" (Gard. Chron. Dec. 4th, 1858, p. 883, described from fruit ripened at Kew). Succulent fruits edible and have a delicate flavour somewhat resembling that of the Pine-apple (Agric. News, Barbados, Nov. 25th, 1905, p. 359); taste between a pine-apple and a banana (Bailey, Cycl. Hort. iv. p. 2063). Fruits were on sale at Covent Garden Market (1905), that

had been sent from Portugal in small boxes labelled "Pine-tree fruits"; they realised 12*s*.–18*s*. per box (Gard. Chron. Sept. 30th, 1905, p. 249; Agric. News, l.c.), Fruits ripened at the Experiment Station, Trinidad, (March 1906) were described as of excellent quality and much appreciated as a rare table delicacy (Bull. Misc. Inf. Roy. Bot. Gardens, Trinidad, 1906, p. 73).

May be raised from seed or propagated by cuttings, and thrives in rich well drained soil.

Cyrtosperma, Griff.

Cyrtosperma senegalense, *Engl.*; Fl. Trop. Afr. VIII. p. 198.

Ill.—Schott, Gen. Aroid. t. 85, ff. 1–10 (*Lasimorpha senegalensis*); Bot. Mag. t. 7617.

Nupe (Barter), Old Calabar (Holland), Munchi Country (Dalziel), Cameroons, Fernando Po and Lower Congo usually in Swamps.

A decorative aroid, 6–12 ft. high with large tuberous roots; introduced to Kew from Old Calabar, 1897.

LEMNACEAE.

Lemna, Linn.

Lemna polyrhiza, *Linn.*; Fl. Trop. Afr. VIII. p. 201.

Ill.—Fl. Danica, ix. t. 1589; Lam. Encycl. t. 747; Rchb. Ic. Fl. Germ. vii. t. 15, f. 17; Syme, Eng. Bot. ix. ed. 3, t. 1397; Hegelmaier, Monogr. Lemnacéen, t. 13, ff. 10–16, tt. 14–15 (*Spirodela polyrrhiza*); Engl. & Prantl. Pflan. ii. pt. 3, pp. 164 & 154, ff. 101A, 102 (*Spirodela polyrrhiza*).

Greater Duckweed.

Onitsha (Barter, No. 583, Herb. Kew), British East Africa and widely distributed in warm and temperate countries.

Found in ponds Onitsha (Barter, l.c.).

It is suggested that the same value may be attributed to this aquatic as to *Lemna minor*, Linn. (Fl. Trop. Afr. viii. p. 202), the "Lesser Duckweed," also figured in the above mentioned works, recorded from Eritrea, Abyssinia, and common throughout the warm and temperate regions. Although so far not collected in Nigeria may possibly occur there. This aquatic weed has been recommended by Major Adie as a means of preventing Mosquitos from laying their eggs on water and it is stated that "tanks covered with it will never contain larvae of Culicidae [Mosquitos] whilst others at the same time of the year are full of them" (Theobald, Monogr. Culicidae; Review in Nature, lxxvi. Sept. 5th, 1907, p. 467; Bull. Misc. Inf. Roy. Bot. Gardens, Trinidad, Jan. 1908, p. 28). The plant is said (l.c.) to be found in the Cedros district, Trinidad, though far from common in the Island and it is suggested for use on

artificial reservoirs. In Jamaica it is fairly plentiful, some tanks in the centre of the Island having been observed thickly covered (l.c).

CYPERACEAE.

Kyllingia, Rottb.

Kyllingia erecta, *Schumach. & Thonn.*; Fl. Trop. Afr. VIII. p. 274.

Vernac, name.—Turari (Lagos, *Dawodu*).

Lagos, Nupe, Burutu in Nigeria and in other parts of Upper Guinea, in Mozambique and in South Africa.

The creeping rhizomes, sweet scented, used medicinally, Lagos (Dawodu, Herb. Kew). "Sweet scented" is also the description on a specimen from B.E. Africa (Col. Porter, May 1910). Found on the river littoral, average height 1–2 ft. Burutu (Parsons, Herb. Kew), in swamps, Nupe (Barter, Herb. Kew).

Juncellus, C. B. Clarke.

Juncellus alopecuroides, *C. B. Clarke*; Fl. Trop. Afr. VIII. p. 307.

Ill.—Rottb. Descr. t. 8, f. 2 (*Cyperus alopecuroides*); Journ. Linn. Soc. xxi. t. 2, f. 12 (*C. alopecuroides*).

Bornu (Vogel. Fl. Trop. Afr. l.c.) in N. Nigeria, and found also in Senegambia, Cape Verde Islands, Nile Land—Kordofan (Kotschy, 1842, Herb. Kew), etc., in Angola, Nyasaland, and in North Africa, the Mascarene Islands, India, Malaya, Queensland.

Stems solitary, 1½–3 ft. long (Clarke, l.c.).

See under *Cyperus exaltatus* for uses, etc., in association with *C. exaltatus*, var. *dives*.

Cyperus, Linn.

Cyperus articulatus, *Linn.*; Fl. Trop. Afr. VIII. p. 356.

Ill.—Pal. de Beauv. Fl. Oware & Benin, ii. t. 97, f. 2 (*C. niloticus*).

Vernac. names.—Kajiji (Hausa, *Dalziel*); Chasegj (Arabia, *Barbey*); Adrue (W. Indies, Mus. Guide).

Old Calabar, Rivers Niger and Benue, Lake Chad, Cameroons, on the Gold Coast, Senegal and widely distributed in tropical and warm regions.

Tuberous roots, fragrant, wild and cultivated in Bornu and planted near houses in Munchi; much used as a perfume for clothing and as a medicine (Dalziel, No. 825, Herb, Kew; Hausa Bot. Voc. p. 55); often cultivated in West Africa by the women near their huts, for the sweet-smelling rhizomes, used in native perfumery (Chevalier, Bull. Soc. Nat. d'Accl. 1912, p. 346); stems used for making mats, Lagos (Dawodu, Herb. Kew) and in Senegal

(Dollinger, Herb. Kew). An infusion of Adrue Root is used in fevers, W. Indies (Mus. Kew).

Stems 3–6 ft. high; common in low-lying ground.

Cyperus auricomus, *Sieber*; Fl. Trop. Afr. VIII. p. 373.

Vernac. name.—Gizgiri (Hausa, *Dalziel*).

Nupe, Sokoto.

Tuberous roots slightly fragrant, used like "Kajiji," Sokoto (Dalziel, No. 548, 1911, Herb. Kew; Hausa, Bot. Voc. p. 39).

Stems 3–4 ft. high, found growing in marshy places, Sokoto Province (Dalziel, l.c.), margins of pools, Nupe (Barter, Herb. Kew).

Cyperus esculentus, *Linn.*; Fl. Trop. Afr. VIII. p. 355.

Ill.—Transv. Agric. Journ. iii. Oct. 1904–July 1905, t. 50; Transv. Dept. Agric. Rep. 1903–04, t. 5; McAtee, U.S. Dept. Agric. Bull. No. 465, 1917, ff. 27, 28.

Vernac. names.—Aya (Hausa, *Dalziel*); Watuje (Fufulde, *Dalziel*); N'ton (French West Africa, *Chevalier*); Einches (Transvaal, *Burtt Davy*); Chufu (U. States, *Piper*, *McAtee*); Chufas (S. Europe, Mus. Kew).—Tiger Nut, Zulu Nut, Nut Sedge, Rush Nut, Earth Almond.

River Niger, Abinsi, Sokoto, etc., in Nigeria, Cameroons, and all Upper Guinea, Lower Guinea, Nile Land, Mozambique, etc., and in nearly all warm countries including parts of America and S. Europe, where it is said to be a native.

Tubers eaten in S. Europe, Gold Coast (Mus. Kew), roasted and eaten by the natives Damaraland (Herb. Kew); a form with large tubers is cultivated on a large scale in Southern Soudan, on the Gold Coast, Ivory Coast and Upper Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 346); cultivated for its small edible tuber, Hausaland (Dalziel, Hausa Bot. Voc. p. 9). "Aya" is a staple food in Yola amongst the Pagans and is cultivated also by their Mohammedan neighbours, who declare, however, that "as a food it does not fill the belly" (Dalziel, Kew. Bull. 1910, p. 141); roots used as food in India, where they are also officinal under the name "Kaseru" (Dict. Econ. Prod. India); valuable as a duck food, United States, (McAtee, l.c.) where also the tubers are eaten as human food or pastured to hogs (Piper, *seq.* p. 596).

The tubers (air dried) have been found to contain 28 per cent. of fatty substances and 43 per cent. of carbohydrates (Czapek Bioch. der Pflanzen, i. p. 137), the leaves have shown on analysis 7·1 per cent. water content, 14·01 per cent. fibre in fresh material and 15·3 per cent. fibre in dry material (l.c. p. 534).

A low growing perennial, forming tufts of stiff, pointed, almost triangular, leaves. In France the plant is propagated in April or May either from the tubers or by division of the tufts; the crop is gathered in October or November, and may be stored for the winter (Vilmorin-Andrieux, Pl. Potageres, p. 659). In the Southern States, U.S. America, the plant is propagated by tubers, planted in spring about 1 ft. apart in rows wide enough to admit

of cultivation. One peck of tubers is required to plant an acre, and it is advisable to soak them a few days before planting. The yield is variable—6992 lb. to the acre; 172 bushels green or 115·24 bush. dry and an average of 22·8 bushels per acre being given—one bushel weighs 44 lb. (Piper, Forage Pl. p. 596). It is more or less of a weed in many countries, and it is difficult to eradicate when once established.

Ref.—" The Chufa or Earth Almond," Pharm Journ. [3] vi. 1876, p. 748.——" Chufa: Value as a Duck Food," McAtee, U.S. Dept. Agric. Bull. No. 465, 1917, " Propagation of Wild Duck Foods," pp. 28–31.

Cyperus exaltatus, *Retz.*; Fl. Trop. Afr. VIII. p. 370, and var. **dives,** *C. B. Clarke,* l.c. (*Cyperus dives,* Delile, Fl. Egypte, p. 5).

Ill.—Delile, Fl. Egypte, t. 4, f. 3 (*C. dives*).

Vernac. names.—Karan masallachin Kogi: gwaigwaya (Hausa, *Dalziel*).

Katagum, Abinsi, Lagos in Nigeria and recorded from Kordofan and B.E. Africa. Abundant in S.E. Asia and Australia and also found in the Mascarene Islands, Mexico and Brazil (Fl. Trop. Afr. l.c.). Clarke (l.c.) gives the var. *dives* as widely distributed in Tropical Africa, also in Egypt, Syria, Madagascar and India, but adds that it cannot be distinctly separated from the species (*exaltatus*) itself, therefore neither can its area of distribution. The economic application may also be regarded as one in which might be included *Cyperus alopecuroides,* Rottb.

Used for making mats, India (Watt, Dict. Econ. Prod. India). The var. *dives* C. B. Clarke (*C. dives* Del.) and *Juncellus alopecuroides,* C. B. Clarke (*C. alopecuroides,* Rottb.) are stated by Delile (Fl. Egypte, p. 5) to grow together in Egypt, where both plants are used for making mats; the native name of the last-mentioned (*see* Shepherd, *seq.*, p. 78; Muschler, Fl. Egypt, p. 167) is "Samar," and in making the reed mats employed for so many purposes in Egypt and elsewhere, the reeds are split and woven over string, and it is estimated that one qantar [100 Rottoli = 98·046 lb.] of reeds is sufficient for about 25 square metres of matting.

Two samples of stems under the name of *Cyperus alopecuroides,* from Egypt, were examined at the Imperial Institute for paper-making; they gave " a fair yield of pulp of moderate quality, but the presence of a considerable amount of pith may interfere with their utilisation"; it was further reported that " it is unlikely that these stems could be remuneratively exported as a paper-making material, but they might be utilised in Egypt for this purpose." (Bull. Imp. Inst. 1919, p. 152).

These plants grow 3–4 ft. high, more or less, and are found in pools or standing fresh water. " Samar " in Egypt is grown for reclamation purposes. The cultivation is regarded as simple—somewhat after the same methods as for rice; but unlike this the water is never drained off—the ground is prepared by

ploughing and levelling; the plants are scattered broadcast over the land and are then thrust into the mud at about 16–20 in. apart, 2–4 inches of water having previously been let on; weeding is attended to as required and water is added according to the size of the plant which when full grown will stand a depth of about 16 inches. Two or three pickings may be obtained from a crop planted in March. The flowering stem is pulled or split in two either by the teeth or a specially shaped knife; the reeds are then laid out to dry, being heaped every night and redistributed in the morning; after drying they are tied into bundles of convenient size and are then ready for the market. The yield per feddan [about an acre] varies with the condition of the soil, as much as 40 qantars [nearly 1000 lb.] being obtained in a season's cropping; but the average cultivator is satisfied if he gets half this amount (Shepherd, *seq.* pp. 78–79).

The following references may also apply to *C. exaltatus.*

Ref.—"Samar (*Cyperus alopecuroides*) as a Reclamation Crop," Shepherd, in Agric. Journ. of Egypt, ii. part 2, 1912 (Cairo 1913) pp. 78–80.——"*Cyperus alopecuroides*," in "Investigations of Materials suggested for the Manufacture of Paper," Bull. Imp. Inst. xvii. 1919, pp. 152–154.

Cyperus fertilis, *Boeck.*; Fl. Trop. Afr. VIII. p. 341.

Ill.—Clarke, Ill. Cyperaceae, t. 12, ff. 3–6.

Old Calabar, Oban, Cameroons, Lower Guinea and the Congo.

A decorative plant increasing by runners; suitable for hanging baskets. Introduced to cultivation at Kew in 1897; thrives in its native country in moist shady places.

Cyperus Haspan, *Linn.*; Fl. Trop. Afr. VIII. p. 332.

Ill.—Rottb. Descr. t. 6, f. 2 (*C. flavidus*).

Lagos, Abeokuta, Nupe, Sokoto and widely distributed in Tropical Africa and many hot countries, including India.

Salt is prepared on a small scale for local use by the Natives, East Africa. The ash is treated with water in a basket, the liquid which passes through is boiled down and the salt recovered. This is somewhat similar to the "Kegr" salt of Nigeria (*see* under *Salvadora persica*, p. 428). Analysis shows the percentages of Potassium chloride, 77·77; Potassium sulphate, 18·48; Ferric oxide, and Alumina, 0·23; Silica, 0·25; Water, 2·39; Insoluble matter, 0·35 and traces of calcium, magnesium and sodium salts (Der Pflanzer, viii. 1912, p. 678; Bull. Imp. Inst. 1913, p. 148).

A plant with long creeping rhizomes, found on the sandy banks of the River Nun (Niger) (Vogel Herb. Kew) in ditches, Sokoto (Dalziel, No. 459, Herb. Kew) in moist places, Nupe (Barter, No. 1572, Herb. Kew), and a common weed in rice-fields in many hot countries.

Cyperus maculatus, *Boeck.*; Fl. Trop. Afr. VIII. p. 363.

Vernac. name.—Turadi (Nupe, *Barter*).

Abinsi (Dalziel, No. 811, 1912, Herb. Kew); Nupe (Barter, Nos. 1213, 1571, Herb. Kew) in Nigeria and also known from

Senegal, Sierra Leone, Cape Verd, Nubia, Lower Congo, Mozambique, and Mascarene Islands.

Tubers are sold in the markets of Nupe; they yield an agreeable perfume when burnt (Barter, l.c.).

Stem sub-erect, bulbous; found in alluvial soil, Sierra Leone (Scott Elliot, Herb. Kew); common in sandy soil near the river (Niger) in Nupe (Barter l.c.).

Cyperus Papyrus, *Linn.*; Fl. Trop. Afr. VIII. p. 374.

Ill.—Bruce, Travels, v. p. 1; Koops, Hist. Acct. Subst. Descr. Events, etc.; Hayter, Herculaneum Manuscripts, tt. 1–5; Tratt. Arch. ii. tt. 182, 182a; Parlatore, Mem. Papyrus (Mem. Acad. Sci. Paris, xii. 1853), t. 1 (*Cyperus syriacus*); t. 2 (*C. Papyrus*); Johnston, Uganda, i. pp. 107, 351; Rev. Hort. 1902, p. 39; Gartenfl. 1905, p. 577; Temple, Fl. and Trees, Palestine, frontispiece; Bull. Agric. Congo, Belge, iii. 1912, p. 519, f. 358; Karsten & Schenck, Veg. bild. xii. t. 6.

Papyrus.

Lagos (Barter, No. 20153, Herb. Kew), Old Calabar (Robb, Herb. Kew) and also found in the Lower Congo, Gaboon, Angola, Congo Free State, Nyasaland and the var. *Antiquorum*, C.B.Cl. is recorded for the White Nile, B.E. Africa, Portuguese E. Africa, Mozambique and Northern part of the Nile and in Palestine.

Used in ancient times as a material for writing upon, the paper, so-called, being made from thin slices of the stem; specimens from Egyptian Tombs in the Museum at Kew are translucent. Ancient funeral wreaths from Egypt in the Museum Collection show stems of this plant as used for the base and thin strips to bind on the flowers.

As a paper-making material and for fuel the plant as forming the main element of the Sudd region of the Nile, has recently come under review. Samples of papyrus have been examined at the Imperial Institute from the Bahr el Gebel, Sudan, the East Africa Protectorate and Zululand; the material gave a yield of paper-pulp about equal to that furnished by a specimen of "esparto" grass (*Stipa tenacissima*) treated in the same way; the pulp was of satisfactory quality and consisted of fibres of about the same length as those of esparto grass pulp. It was recommended to convert the Papyrus into "half-stuff" locally for export, as the air-dried stems could not be profitably exported; the price in the United Kingdom (1911—Sudan and East Africa; 1914—Zululand) would not be more than about £3 per ton (Col. Rep. Ann. No. 687, 1911, p. 24; No. 882, 1916 (for 1914), p. 20). A similar report was made as the result of experiments carried out by Dr. Beam at the Laboratory, Khartum, and on a larger scale for the Sudd Fuel (Suddite) Company by Messrs. Tullis Russell & Co. and by Messrs. Thomas & Green under the auspices of Messrs. Cross & Bevan (Journ. Roy. Soc. Arts, July 9th, 1915, p. 772). As a fuel it was proposed to make of

the "Sadd" in the upper reaches of the White Nile briquettes similar in shape and cubic capacity to brown coal briquettes, using machinery capable of dealing with 50 tons of fuel a day (l.c. Dec. 2nd, 1910, p. 62) and for this purpose a company—"Sudd Fuel (Suddite) Ltd."—was formed in February 1912; the concession granted was approximately 375,000 acres and a factory with an output of 50,000 tons per annum was to be erected in the neighbourhood of Taufikla. "Suddite" was the name of the fuel and it was proposed also to export material for the manufacture of paper. Nothing, however, seems to have come of this, and the Company it is understood has ceased to exist. Similar concessions for the manufacture of paper-pulp have been made in the French Congo—Bass-Ogoué (Agron. Col. v. 1920, p. 165), in Zululand (Bull. Imp. Inst. 1918, p. 578, 1920, p. 540), and in the Belgian Congo—Lower Lualaba (Commerce Rep. Washington, August 16th, 1920, p. 802).

The stems of Papyrus grow from 8–15 ft. high and the Sudd or "Sadd" formation of the Nile includes other plants—*Typha australis*, *Panicum pyramidale* (Photo in Mus. Kew from Bahr el Ghazal, Broun, 1904). "Ambatch" (*Herminiera Elaphroxylon*) *see* p. 199 of this work, "Water Lettuce" (*Pistia stratiotes*)—*see* p. 754, etc., and to keep rivers and waterways clear continual dredging is necessary. Near Lagos it is found in the Lagoons and in the Badagry District it fringes the banks of the rivers and streams, continually blocking the waterways (Kew Bull. 1893, p. 183). Papyrus has been planted for commercial purposes along the canals on an estate in the Belbeis district near Cairo. The plant is easily but not very quickly propagated by means of offshoots, planted about 3 ft. apart in March (Egypt); it may also be raised from seed, best sown on sphagnum moss. The seedlings take about two years to become strong plants (Kew Bull. 1911, p. 476). Division of the roots is the means of propagation at Kew, where the plant grows freely in fresh water.

Ref.—"Papyrus," in Historical Account of the Substances which have been used to describe events, etc., from the earliest date to the Invention of Paper, Koops, pp. 133–155 (London, 1801).——A Report upon the Herculaneum Manuscripts (containing an Account of the Papyrus), Hayter, pp. 1–141, with 5 hand coloured plates of the Papyrus plant (London, 1811).——Remarks on Peyrous' Account of Egyptian Papyrus (Mem. di Torino, xxxi. 1826) in the Quarterly Journ. of Science, Literature and the Arts, xxii. 1827, pp. 345–349.——Mémoire sur Le Papyrus des Anciens et sur Le Papyrus de Sicile (Mem. L'Acad. des Sci. Paris. 1853), Parlatore, pp. 1–34.——"On Papyrus, Bonapartea and other Plants which can furnish fibre for Paper Pulp (Brit. Assoc. Rep.) De Claussen, in Pharm. Journ. xv. 1855, pp. 236–237.——"Papyrus des Anciens Egyptiens (*Papyrus Antiquorum*)" in Cultures Egyptiennes Plantes Tropicales Utiles Officinales et Industrielles, Delchevalerie, pp. 54–57

(Cairo, 1870).——"The Papyrus," Thiselton-Dyer, in Gardeners' Chronicle, iii. 1875, p. 78.——"*Cyperus Papyrus*," in Useful Fiber Plants of the World, Dodge, U.S. Dept. Agric. Fiber Investigations, Report No. 9, 1897, p. 144.——"The Papyrus Plant" in "The Sadd of the Upper Nile: Hope, in Annals of Botany, xvi. Sept. 1902, pp. 498–500.——"Le *Cyperus Papyrus* et sa multiplication par le Semis," Lochot, in Revue Horticole, 1902, pp. 38–39.——"Unter den Papyren des Anaps," Lopriore (Catania), in Gartenflora, liv. 1905, pp. 576–580.——"*Cyperus Papyrus*," in Alexandria Hort. Soc. Bull. No. 2, 1907, pp. 64–66. ——"A New Fuel for the Sudan," Journ. Roy. Soc. Arts, lix. Dec. 2nd, 1910, pp. 62–63.——"Papyrus from the Sudan and the East Africa Protectorate," Bull. Imp. Inst. x. 1912, pp. 372–373, with analysis in comparison with Esparto from Oran, Algeria.——"Papyrus for Paper-Pulp," Journ. Roy. Soc. Arts, lxiii. July 9th, 1915, p. 772.——"Papyrus from Zululand," Bull. Imp. Inst. xiv. 1916, pp. 165–167.——"Papyrus Stems: *Cyperus Papyrus*," in "Investigations of Materials Suggested for the Manufacture of Paper," l.c. xvii. 1919, pp. 154–155; xviii. 1920, pp. 323–325—in Egypt.——"Papyrus in Zululand," l.c. pp. 540–543—Harvesting, Yield and Manufacture of Pulp.

Cyperus rotundus, *Linn.*; Fl. Trop. Afr. VIII. p. 364.

Ill.—Rottb. Descr. t. 14, f. 2 (*C. hexastachyos*); Desfont. Fl. Atlant. i. t. 8 (*C. tetrastachyos*); U.S. Dept. Agric. Rep. 1887, t. 13; Dept. Agric. West Australia, Bull. No. 32, 1910, p. 11.

Vernac. names.—Giragiri, Aiya-aiya (Hausa, *Dalziel*); Nut-grass, Coco-grass (Tavera, Med. Pl. Philippines, p. 239).

Yorubaland, Nupe, Sokoto and widely distributed throughout Tropical Africa and in all warm countries.

Root edible, slightly fragrant, Hausaland (Dalziel, Hausa, Bot. Voc. p. 9); said to yield an essential oil in Upper India which the natives use to perfume their clothes; largely used in perfumery, Bengal and for various medicinal purposes. Cattle in India eat this so-called grass and hogs are fond of the roots (Watt. Dict. Econ. Prod. India). The bruised root is applied to the face for toothache, and other medicinal uses are attributed to the root, Philippines (Tavera, l.c.).

Propagated readily from seeds and tubers and appears to be more or less of a pest in cultivated fields and rice lands everywhere.

MARISCUS, Gaertn.

Mariscus umbellatus *Vahl*; Fl. Trop. Afr. VIII. p. 390.

Ill.—Rottb. Descr. t. 4, f. 2 (*Kyllingia umbellata*).

Vernac. names.—Aiya (Lokoja, *Elliott*); Ataku main-ya Onica Olona, S. Nigeria, *Thomas*); Efa (N. Nigeria, Exhibit Imp. Inst.).

Nupe, Lagos, Yola, Zungeru, Cross River, Cameroons, and in general throughout Tropical Africa and the Tropics of the Old World.

Rhizomes eaten raw or roasted, N. Nigeria (Exhibit, Imp. Inst.); cultivated at Lokoja (Elliott, Herb. Kew).

Found on river banks, Yola (Dalziel, Herb. Kew); common in damp woods, Mauritius and Seychelles (Baker, Fl. Mauritius, p. 415); and apparently more or less of a common weed.

GRAMINEAE.

EUCHLAENA, Schrad.

Euchlaena mexicana, *Schrad.* Ind. Sem. Hort. Gotting(1832) [*E. luxurians*, Durieu & Aschers, Bull. Soc. Linn. Paris, i. (1877), p. 107].

An annual plant, 6–8 ft. high, sometimes up to 15 ft. Stems ½ in. thick or more at the base. Leaves 3–4 ft. long, 2–3 in. broad.

Ill.—Bot. Mag. t. 6414; Engler, Pflan. Ost. Afr. B. p. 79; U.S. Dept. Agric. Rep. 1887, t. 1; Journ. Dept. Agric. W. Australia, ix. May 1904, p. 320; Transv. Agric. Journ. iii. 1904–05, t. 84; Bull. Agric. Congo Belge, v. 1914, p. 667; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 284, f. 171.

Teosinte, Buffalo Grass.

Native of Mexico and Guatemala. Grown at Botanic Station, Lagos, 1892, and widely distributed form Kew about 40 years ago to other parts of Tropical Africa, to the West Indies, East Indies and Australia. Cultivated in the Southern United States, and in Central America.

An important fodder plant, may be used either as green feed or as ensilage.

Propagated from seed; 4½–5 lb. to the acre, sown broadcast, —15 kg. per hectare broadcast and 25 kg. if sown in rows are recommended in Tucuman (Bull. Bur. Agric. Inst. Rome, ii 1911, p. 2034)—and thinned out 10–12 ft. apart, the plants forming dense tufts. A warm climate, average rainfall and good loamy soil are essential to satisfactory growth.

For feeding, the grass should be cut young, and although an annual plant—comes to maturity in from 9–10 months (Watt) from the time of sowing—3 cuttings may be made in the course of a 4 months' season. Weeding, and in the case of rows, banking up, is all that is needed. Mowing is begun before flowering, when the height scarcely exceeds one metre, and is continued till the end of the flowering period. The yield is 100 tons per hectare of green fodder—89 per cent. of which is eaten by cattle, the lower woody part of the stalks being rejected (Bull. Bur. Agric. Inst., Rome, l.c.). Five acres of this grass sown at the Experiment Station farm, Kabete, Nairobi, was

reported to be slow at the commencement, but later grew rapidly with a renewed rainfall and gave a very large yield; it stood over 8 ft. in height before being cut (Ann. Rep. Dept. Agric. B.E. Africa, 1912–13, p. 119). Of several other fodder plants introduced to Lagos (1892) Millen reports (Rep. Bot. St. Lagos, 30th Sept. 1892) on this one—seeds purchased from Vilmorin, Andrieux & Co. Paris, " germinated freely," and (1894) " I have planted a quantity of plants of *E. luxurians*, the only fodder plant of those introduced which appears to be growing with good results " (l.c. 30th June 1894; Kew. Bull. 1894, p. 382). In India in some places the grass has been favourably reported on, while in other parts it has failed, and " the general opinion is that it could never compete with the existing fodder plants of India, such as Juar " [*see Sorghum*] etc., as its cultivation on a large scale would be too expensive owing to its requiring rich soil and constant irrigation (Watt, Dict. Econ. Prod. India). It flowered at Kew in December 1879 in the Water-lily House, where it attained a height of 15 ft. (Christy, *seq.* p. 6).

Ref.—" Teosinte (*Euchlaena luxurians*, Durieu)," in New Commercial Plants, Christy, No. 3, 1880, pp. 5–7.——" *Euchlaena luxurians*; Teosinte," Kew Bull., 1894, pp. 380–382.——" Note sur le Teosinte (*Reana luxurians*)," Chalot, in L'Agric. prat. pays chauds, i. 1901–02, pp. 129–136.

ZEA, Linn.

Zea Mays, *Linn.*; Fl. Trop. Afr. IX. p. 26.

Ill.—Bentley & Trimen, Med. Pl. t. 296; Duthie, Field & Garden Crops, t. 5; Church, Food Grains, India, p. 64; Köhler, Med. Pflan. iii.; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 285, f. 172, p. 286, f. 173.

Vernac. names.—Masara (Hausa, *Dalziel*); Amarsk, Nyin, Kabe, (Sierra Leone, *Thomas*); [Abru (Fanti), Abblay (Accra), Agbahdor (Gold Coast) *Easmon*]; Agogoda Kome, Niole, Gbaguen, Toga or Khevet, Kinto, Hounve, Gboli—names of various varieties (Dahomey, *Henry*)—Maize, Corn, Indian Corn, Mealie Corn or Mealies (S. Africa).

Native of Tropical America, and under cultivation in almost every tropical or sub-tropical quarter of the globe.

A well-known cereal used everywhere—the grain for food—green as a vegetable, or as the basis of various patent foods, " corn flour," " force," " grape nuts," etc., and the plant for fodder. Maize corn is commonly used for feeding to stock, parrots, poultry and game. The variety " Cinquantino " (five sided)—also known as " small Yellow Flint " and " Bessarabian " (Agric. Journ. Union of S. Africa, 1911, p. 416) is suitable for feeding pigeons; it is shipped from the Danube and comes occasionally into the London market. The cake made from the germs after expression of the oil is recommended as a good feed for animals, especially dairy cows; for fodder, the plant

is cut and fed green, as ensilage, or dried as hay. In the Azores the dried leaf, called "folha de gavella" is largely used as fodder for animals (Cons. Rep. No. 4413, 1910, p. 4).

A sample of Maize refuse from Nyasaland was found to contain a fair quantity of fat and carbohydrates, but the percentage of nitrogen was low. In admixture with materials richer in proteins it could be used as food for cattle (Col. Rep. Ann. No. 778, 1913, p. 37).

Maize is also an important source of alcohol in the United States and in Spain. Distillers' Corn ("Yellow Dent") has been found to contain 57·9 per cent. of starch and 2·3 per cent. of sugars. One ton (2000 lb.—United States) of grain, made up of 1850 lb. of maize and 150 lb. of malt, is calculated to yield 100 gallons (or approx. 2·5 gallons per bushel) of alcohol—the grain contains 64 per cent. of starch (Kew. Bull. 1912, p. 121). For paper-making it has been found that the whole stalk may be resolved into pulp and cellulose of the finest quality for paper, provided the cobs are removed in the milk-stage—when there is little deposition of the hard siliceous matter which forms the outer coating of the stalk when the ears are allowed to ripen, the cellulose thus obtained is also suitable for the same uses as cotton cellulose (U.S. Dept. Agric. Exp. St. Rec. Sept. 1912, p. 314; Agric. News, Barbados, Jan. 4th, 1913, p. 9).

Other manufactured products include glucose or syrup, starch, meal, oil, and a rubber substitute—useful as a filler and insulator; used extensively in the manufacture of small rubber articles, belts and tyres; the product has a good deal of resiliency, and is graded as soft, medium and hard; it is prepared by the Corn Products Refining Co., New York, under the name of "Paragol" (India-Rubber World, July 1st, 1912, p. 505).

In the manufacture of glucose the germs of the seed are taken out for the extraction of corn oil, of which they contain 30 per cent.—may be used as a salad oil, paint oil, or manufacture of rubber substitute. The residue, after the glucose is extracted, is of value for feeding stock as "gluten feed," and the residue of the germs after the extraction of the oil is the "corn oil cake" above mentioned. The grain during the war was an important source of acetone for the manufacture of cordite and aeroplane dope (Chapman, Micro-organisms and their Industrial Uses, Journ. Soc. Arts, 1921, p. 609).

The husks are used in matting, the stalks and pith in packing, and corn cobs in making tobacco pipes, United States (Montgomery, *seq.* p. 249); tobacco pipes made of maize cobs have also been sold in England (Mus. Kew), and there is also in the Museum at Kew a door mat from Natal, a hat from Jamaica, cigarettes and cigars from India, Burma and Mexico, in which maize husks have been used in the manufacture. The pith of the stalk is used in the United States Navy as a substitute for coco-nut fibre, for purposes such as lining the hull of ships and manufacturing explosives; the stalks are recommended for

fuel, and gas retorts charged with maize cobs (after the removal of the grain) has produced a good quality gas (Bull. Bur. Agric. Inst. Rome, ii. 1911, p. 2313).

Various samples of maize from the Southern Provinces, Nigeria, were reported (1917) on as suitable for export to the United Kingdom, and, if in good condition, for human consumption, as a feeding stuff for animals, and also for the production of alcohol. The varieties included "Lagos White Maize," "Lagos Maize (Yellow)," "Native Flour Corn from Badagry" (white), "Laguna" (white), "Garrick Prolific" (white), "Natal Maize" (white), "St. Charles" (white), "Creole" (dark yellow), and three "Selected"—119, white; 120, white and 165, dark yellow grain, all of which are recommended for cultivation. The commercial valuation of the grain, c.i.f. in London (Aug. 1917) was from 75*s*.—80*s*. per quarter of 480 lb. Locally all the varieties were found to give satisfactory results for "agidi" makers in Ibadan, the white grain being preferred (Johnson, Ann. Rep. Dept. Agric. 1917, pp. 5–7; Trade Suppl. Nig. Gaz. Nov. 29th, 1917, p. 134).

The cultivation is comparatively easy and similar to that of *Sorghum;* though maize as a rule requires more moisture. Maize planted in the usual native fashion—seed sown in April on ridges 6 ft. apart—was ready for reaping in August, and, for comparison, Guinea corn sown in May on one side of such ridge, so that the two crops grew together, was not ready for harvesting until December (Thornton, Exp. Farm, Ilorin, Ann. Rep. Agric. Dept. N. Prov. 1917, p. 13). It is generally well-known throughout the tropics and sub-tropics. British West Africa is one of the chief sources of supply, which in 1913 amounted to 55,053,547 centals from all sources, including Argentine, United States, Russia, Roumania, Canada, British India, [B.W. Africa], British South Africa, Bulgaria, Turkey, Egypt, Morocco, Uruguay (Kew Bull. 1919, p. 21). There are so many varieties under cultivation that it would not be possible to even enumerate them here—they include "Field Corn," "Sweet Corn," and "Pop Corn," of which there are 461, 352 and 54 varieties respectively, enumerated as grown in America (Tracy, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 21, 1903, pp. 134–164). Improvements by selection and hybridisation are constantly being made by the various Agricultural Departments in the Colonies, and this together with the use of modern machinery for sowing, shelling, storing, etc., as indicated in the following references, has placed the industry on a sound footing everywhere.

Experiments in hybridising were started at Ajugi Farm, Ilorin (1913), with "Hickory King" and a native variety (Thornton, Ann. Rep. Dept. Agric. N. Nig. 1913, p. 14). In 1917, "Hickory King" was reported to have met with great favour from the native farmers in Ilorin, two hundred having been supplied with seed, and by 1919 it was expected that the cultiva-

tion would have become general throughout the province, and seed had also been supplied to Bida, Kontagora and Maiduguri (l.c. 1917, p. 14). This variety was indented for, amongst several others, all grown in America, in 1912 (Letter Crown Agents to Director, Kew, 17th Aug. 1912), for the Dept. of Agriculture in Nigeria. It is considered one of the best for soils of medium fertility (Agric. News, Barbados, Oct. 19th, 1907, p. 323); it has yielded as much as 50 tons of green fodder per acre in New Zealand (Ann. Rep. Dept. Agric. New Zeal. 1909, p. 443). This variety and " Cuzco "—also known as " Peruvian," a very fine variety which grows 20 ft. or more in its native habitat, the Andes, at an elevation of 7000–8000 ft. (Agric. News, Barbados, 1903, p. 262)—have been found to yield abundantly and best suited to grow in British East Africa (Kenya Colony), where, next to potatoes, maize is the principal crop grown by the European settlers, and the cultivation has met with great success (Bull. Imp. Inst. 1906, p. 273).

The yield may vary considerably; an experiment in white maize at Oloke Meji showed the average yield of grain per acre at 2238 lb.; the seeds were sown in rows 3 ft. apart and 2½ ft. apart in the rows, on 30th March, and harvested 27th July. The plot had been manured with sulphate of ammonia and muriate of potash (Govt. Gaz. S. Nigeria, March 3rd, 1909, Suppl. No. 8), and another plot grown at the same time without manure gave an average yield of 1254 lb. per acre (l.c.). A field of 8 acres at Onitsha, sown in April and reaped in August, gave a total weight of corn and cob in husk of 12,408 lb., and one-half of this total weight—shelled, husked, and crushed yielded 2803 lb., this field was manured with guano, bone meal, sulphate of potash and sulphate of ammonia (Dodd, List Pl. Onitsha, July 1907). Five acres of " Lagos White Maize " at the Agricultural Experiment Station, Ibadan, yielded a total of green fodder of 18·4 tons; this was planted 4th April (1911) and cut from 16th May to 30th July (Johnson, Ann. Rep. Agric. Dept. S. Nigeria, 1911, p. 4). This variety is recommended in Sierra Leone, where under experiment it has produced half a ton of cleaned grain per acre, and selected stock for distribution was being sold at 5*s*. for 63 lb., or 1*d*. per lb. (Sierra Leone Gaz., 15th Feb. 1919, p. 106). In the experiments with the 11 varieties at Moor Plantation, Ibadan, above referred to, the average yield of grain was found to be between 17–18 cwt. per acre (Johnson, l.c.). In general a good average yield may be estimated at from 30–40 bushels of grain per acre. The yield from 3 acres of " Hickory King " in Ilorin was 1035 lb., 1126 lb., and 1066 lb. (Thornton, l.c. 1917, p. 14).

Ref.—" A Note upon the Wild State of Maize, or Indian Corn," Journ. Hort. Soc., London, i. 1846, pp. 114–117.——" On the Zea Mays and Other Cerealia of Western Africa," Daniell, in Pharm. Journ., xi. 1852, pp. 347–352, pp. 395–401.——Utility of the Maize Plant, von Welsbach, iv. Foreign Division, Austria,

Inter. Exhib., 1862, 4 pp., printed on Maize Paper (Imp. Printing Establishment. Vienna, 1862).——"On Maize Paper," von Welsbach, in Technologist, iii. 1863, pp. 355–361.——Report on the Use of Maize (Indian Corn) in Europe, etc., Murphy, Wiley & Snow, U.S. Dept. Agric., pp. 1–36 (Office of the Secretary, Washington, 1891).——Corn Culture in the South, Tracy, U.S. Dept. Agric. Farmers' Bull. No. 81, 1898, pp. 1–24.——"Maize and Its Uses," Dunham, in Journ. Roy. Agric. Soc. x. 1899, pp. 116–136, ff. 1–7—Photo-micrographs, grain and starch.——The Commercial Grading of Corn, Scofield, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 41, 1903, pp. 1–23; pls. i.–iv.——The Book of Corn, Myrick, pp. 1–368 (Orange Judd Co., New York, 1903).——"La Conservation du Mais," in L'Agric. prat. pays chauds, iv. 1904, pp. 64–79, with particulars and illustrations of the "Clayton Apparatus" for preserving maize.——The Germination of Seed Corn, Duvel, U.S. Dept. Agric. Farmers' Bull. No. 253, 1906, pp. 1–16.——"Maize or Indian Corn," Harshberger, in Cycl. Amer. Agric. Bailey, ii. pp. 398–402; "Maize Growing," Hartley, l.c. pp. 402–414; "Maize-Growing for the Silo," Van Wagenen, l.c. pp. 414–418; "Pop-Corn (*Zea* (*Mays*) *everta*), Curtis, l.c. pp. 418–421; "The Breeding of Maize," Hopkins, l.c. pp. 421–427 (Macmillan & Co., New York & London, 1907).——Harvesting and Storing Corn, Hartley, U.S. Dept. Agric. Farmers' Bull. No. 313, 1907, pp. 1–29, illustrated.——"Maize Cultivation in South Africa," Sawer, in Natal Agric. Journ., x. Jan. 1907, pp. 17–29; Feb., pp. 127–135, March, pp. 284–290, and May 1907, pp. 473–479.——"Memorandum on the Harvesting and Shipment of Maize," Dunstan, in S. Nigeria Govt. Gazette, Suppl. 20th Nov. 1907, pp. 1–3.——"Maize," in Maize, Cocoa, and Rubber; Hints on their Production in West Africa, Mountmorres, pp. 5–10 (Inst. Comm. Research in the Tropics, Liverpool Univ., and Williams & Norgate, London, 1907); Extract in Gambia Govt. Gaz., 24th Aug. 1907, pp. 283–284.——"The Cultivation and Marketing of Maize," Bull. Imp. Inst., vi. 1908, pp. 261–277.——"The Hand Maize Sheller," Hayman, in Agric, Journ. India, iii. 1908, pp. 125–126; pl. xxiii.——"Some African Food Grains"—"Maize," Bull. Imp. Inst., vii. 1909, pp. 145–148.——A New Type of Indian Corn from China, Collins, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 161, 1909, pp. 1–30; pls. i., ii——Corn Cultivation, Hartley, U.S. Dept. Agric. Farmers' Bull. No. 414, 1910, pp. 1–32, illust.——Seed Corn, *Idem*, Bull. No. 415, 1910, pp. 1–12, illust.——A More Profitable Corn Planting Method, *Idem*, Bull. No. 400, 1910, pp. 1–14, illust.——The Value of First Generation Hybrids in Corn, Collins, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 191, 1910, pp. 1–45.——"Memorandum on the Harvesting and Shipment of Maize, with reference to West African Requirements," Col. Rep. Misc. No. 71, 1910, pp. 207–210.——The Determination of the Deterioration of Maize, with incidental reference to Pellagra, Black &

Alsberg, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 199, 1910, pp. 1–36.——American Export Corn (Maize) in Europe, Shanahan, U.S. Dept. Agric. Bur. Pl. Ind. Circ. No. 55, 1910, pp. 1–42, illust.——" La Culture Intensive du Maïs," Bull. Agric. Congo Belge, i. 1910, pp. 52–60.——" A Preliminary Report on Insects affecting Maize in Southern Nigeria," Thompson & Jemmett, pp. 1–4, coloured plate.——" Malt Vinegar and Maize Vinegar," Juritz, in Agric. Journ. Cape, xxxvii. 1910, pp. 717–736.——" How Maize Growing can be made Profitable," Mundy, in Rhodesia Agric. Journ., viii. Dec. 1910, pp. 223–229; illust. ——" Les Maïs Africain," Yves Henry, in L'Agric. prat. pays chauds, xi. 1, May 1911, pp. 370–386; June, 470–483, and xi. 2, July 1911, pp. 46–57.——" Maize," McDonald, in Agric. Gaz. N.S. Wales, xxii. Dec. 2nd, 1911, pp. 1034–1046; xxiii. Jan. 2nd, 1912, pp. 31–35; May 2nd, 1912, pp. 438–443; Aug. 2nd, 1912, pp. 702–706; Sept. 2nd, 1912, pp. 782–786; xxiv. April 2nd, 1913, pp. 326–330; July 2nd, 1913, pp. 591–596.——" Maize at Grafton Experiment Farm," Haywood, l.c. Oct. 3rd, pp. 889–897, illust. " Yellow Dent," etc.——The Shrinkage of Corn in Storage, Duvel, U.S. Dept. Agric. Bur. Pl. Ind. Circ. No. 81, 1911, pp. 1–11.——The Weed Factor in the Cultivation of Corn, Cates & Cox, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 257, 1912, pp. 1–35, illustr.—Cross Breeding Corn, Hartley, Brown, Kyle & Zook, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 218, 1912, pp. 1–72.——The Seed Corn Situation, Hartley, l.c. Circ. No. 95, 1912, pp. 1–13, illustr. of preserving house.——" Maize from the Sudan," Bull. Imp. Inst., x. 1912, pp. 389–393.——Pop Corn for the Home, Hartley, U.S. Dept. Agric. Farmers' Bull. No. 553, 1913, pp. 1–13.——Pop Corn for the Market, Hartley & Willier, U.S. Dept. Agric. Farmers' Bull. No. 554, 1913, pp. 1–16.——Floral Abnormalities in Maize, Kempton, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 278, 1913, pp. 1–18; pls. i, ii.——A Variety of Maize with Silks Maturing before the Tassels, Collins, U.S. Dept. Agric. Bur. Pl. Ind. Circ. No. 107, 1913, pp. 1–11.——Heredity of Maize Variation, *Idem*, l.c. Bull. No. 272, 1913, pp. 1–23.——" The Preservation and Use of Maize for Stock Feed," Burtt-Davy, in Agric. Journ. Union S. Africa, iv. Dec. 1912, pp. 843–853; v. Jan. 1913, pp. 75–88; Feb. 1913, pp. 234–241; April 1913, pp. 585–592; May 1913, pp. 739–745.——Maize: Its History, Cultivation, Handling and Uses: With Special Reference to South Africa, Burtt-Davy, pp. 1–831; illustrated (Longmans, Green & Co., London, 1914).——Acidity as a Factor in Determining the Degree of Soundness of Corn, Besley & Baston, U.S. Dept. Agric. Bull. No. 102, 1914, pp. 1–45.——Corn Meal as a Food and Ways of Using It, Langworthy, U.S. Dept. Agric. Farmers' Bull. No. 565, 1914, pp. 1–24.——School Lessons on Corn, Lane, U.S. Dept. Agric. Farmers' Bull. No. 617, 1914, pp. 1–15.——Indian Corn, Pamphlet No. 76, 1914, pp. 1–68, issued by the Commissioner, Imp. Dept. Agric. West Indies

(Dulau & Co., London).——Grades for Commercial Corn, Duvel, U.S. Dept. Agric. Bull. No. 168, 1915, pp. 1–11; with plate showing Types of Colour and Types of Damage in Corn Grain. ——Corn Culture in the South-Eastern States, Kyle, U.S. Dept. Agric. Farmers' Bull. No. 729, 1916, pp. 1–19, illust.——Farm Practice in the Cultivation of Corn, Cates, U.S. Dept. Agric. Bull. No. 320, 1916, pp. 1–66, illust.——"The Relation of Cob to other Ear Characters in Maize," Grantham, in Journ. American Soc. Agronomy, ix. May 1917, pp. 201–217.——"Corn," in The Corn Crops, Montgomery, pp 1–275, illust. (The Macmillan Co., New York, 1917).——"Report on Maize from Nigeria," Johnson, in Trade Suppl. Nigeria Gazette, i. Nov. 29th, 1917, pp. 134–135.——"Pop Corn," Agric. News, Barbados, xvii. Dec. 28th, 1918, p. 413.

Coix, Linn.

Coix Lacryma-Jobi, *Linn.*; Fl. Trop. Afr. IX. p. 27.

Ill.—Beauvois, Agrost. t. 24, f. 5 (*C. Lacryma*); Church, Food Grains, India, p. 61; Greshoff, Nutt. Ind. Pl. t. 33; Lisboa, Bombay Grasses, p. 41; Cook & Collins, Contr. U.S. Nat. Herb. viii. 1903, t. 29; Teysmannia, xxix. 1918, p. 454; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 287, f. 174.

Vernac. names.—Boukon, Bonkori, Ewuruwura, Kali bugi (Sierra Leone, *Thomas*).—Job's Tears; a "Pearl Barley" (Manchuria, *Hosie*).

West Africa—Sierra Leone, French Guinea, Liberia [there are no specimens in the Kew Herbarium from Nigeria; but the grass is so widely distributed in Africa that it is given a place here] and also known from Angola, British East Africa, Zanzibar, etc. Cultivated in India, Burma, China.

Plant used as fodder for cattle in India (Duthie, Grasses, N.W. India, p. 19). A coarse cereal which constitutes an important food of the hill tribes of Assam and the Eastern frontier lands of India, replacing to some extent the millets of Northern and Southern India; in Burma the grains are eaten after having been parched like Indian corn. The whole grains of the wild kinds are exceedingly hard and are used as beads; those of the cultivated variety are much softer and more easily husked (Church, Food Grains, India, p. 60).

The seeds, under the name of "Pearl Barley," are exported from Manchuria in the north to the West River in the south, China; they are said to possess diuretic and cathartic properties and are used more in medicine than as food—though they are sometimes boiled and made into gruel and also added in small quantities to flour cakes to attract buyers (Hosie, Rep. Ssechuan, China No. 5, 1904, p. 10). The variety "Ma-yuen" is the edible form cultivated in the Central Provinces, Sikkim, Khasia Hills, Burma, Shan States, Tonkin, China, and Malaya; the shell is soft and easily milled (Watt, Comm. Prod. India, p. 393).

The hard seeds are commonly used for necklaces and various ornamental purposes.

Ref.—" Job's Tears " (*Coix Lachryma*, Linn. var. *stenocarpa*), in Kew Bull., 1888, pp. 144, 145.——" *Coix lachryma*: Job's Tears," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 492–500 ——" *Coix*, spp. (Job's Tears): A Review of all available Information," Watt, Agric. Ledger, No. 13, 1904, pp. 188–229 ——" *Coix*," in Comm. Prod. India, Watt, pp. 392–398.

THELEPOGON, Roth.

Thelepogon elegans, *Roth*; Fl. Trop. Afr. IX. p. 34.

Ill.—Rich. Tent. Fl. Abyssinia, t. 102 (*Andropogon princeps*).

Vernac. names.—Dandata (Katagum, *Dalziel*); Dataniya or Dwatana (Hausa, *Dalziel*).

Lagos, Borgu, Katagum, Yola in Nigeria; also in the Cameroons, Abyssinia, East Africa, Nyasaland, and in the Deccan Peninsula (India).

Fed to horses as a tonic, described as very bitter, Katagum (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 22).

An annual, with culms up to 2 ft. Borgu (Barter, Herb. Kew).

VOSSIA. Wall, & Griff.

Vossia cuspidata, *Griff.*; Fl. Trop. Afr. IX. p. 41.

Ill.—Journ. & Proc. Asiatic Soc. Bengal, v. 1836, t. 23 (*V. procera*); Griffith, Ic. Pl. Asiatic, t. 153; Trans. Linn. Soc. xxix. (1875), t. 116 (*V. procera*).

Katagum, Sokoto, in Northern Nigeria, and widely distributed in Tropical Africa, including Nile Land, Lower Guinea, Belgian Congo, Nyasaland and Portuguese East Africa.

A perennial, growing with the culms submerged or floating in water; found in marshes, Katagum, in muddy pools, Sokoto (Dalziel, Herb. Kew), in the Nile backwater (Grant, Herb. Kew), and as one of the principal constituents of the " sadd " or " sudd " of the Nile and its tributaries (Fl. Trop. Afr. l.c.)—*see* under *Cyperus Papyrus* (p. 764); in jheels [pools or lagoons left after an inundation] of Bengal, Silhet and Assam (Fl. Br. India, vii. p. 151).

JARDINEA, Steud.

Jardinea congoensis *Franch.*; Fl. Trop. Afr. IX. p. 53.

Vernac. name.—Diwa (Hausa, *Dalziel*).

Lagos, Nupe, Abinsi in Nigeria and in Togoland, French Congo, Shari region, Belgian Congo.

Used for making mats, screens and baskets, Abinsi and vicinity (Dalziel, Herb. Kew; Hausa Bot. Voc., p. 25—*Rhytachne congoensis*, Hack).

A perennial, with erect culms 10 ft. high, found in swampy places, river banks, etc., Abinsi (Dalziel, l.c.); 6 ft. high, along

the banks of the Ogun river, Lagos (Millen, Herb. Kew); 10 ft. in moist ground in open plains, Nupe (Barter, Herb. Kew).

Haemarthria, R. Br.

Haemarthria fasciculata, *Kunth*; Fl. Trop. Afr. IX. p. 55.

Ill.—Desfont. Fl. Atlant, i. t. 36 (*Rottboellia fasciculata*); Martius, Fl. Bras. ii. pt. 3, t. 72, f. 2.

Lake Chad, and in British East Africa, Portuguese East Africa, Nyasaland, Rhodesia, Mediterranean region of Africa, also in America.

Dr. Stapf is of opinion that although the Indian plant is slightly different and corresponds to *H. compressa*, R. Br., for all practical purposes it is probably the same as *H. fasciculata*. Of *compressa* it is said that it is a good cattle feed and is the principal fodder in Dacca, India, recommended for moist pastures, and highly esteemed by graziers in Gippsland, Victoria (Mueller), not injured by moderate frost and resistant to drought (Watt, Dict. Econ. Prod. India).

A perennial, with erect culms, 1–5 ft. high, sometimes arising from a decumbent, rooting base.

Manisuris, Linn. f.

Manisuris granularis, *Sw.*; Fl. Trop. Afr. IX. p. 57.

Ill.—Roxb. Pl. Corom. iii. t. 118; Gaertner, Fruct. Sem. Pl. ii. t. 175; Pal. de Beauv. Fl. Oware & Benin, i. t. 14 (*M. polystachya*); Agrost., t. 21, f. 10; Martius, Fl. Bras. ii. pt. 2, t. 46; Symonds, Indian Grasses, t. 53; Lisboa, Bombay Grasses, p. 62; Engler & Drude, Veg. Erde (Pflanz. Afr.), ix. 2, p. 191, f. 135; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 280, f. 169 (*Rytilix granularis*).

Vernac. names.—Andande, Fesi fesi, Guisqui (Sierra Leone, *Thomas*).

Kabba, Yola, Ogurude, in Nigeria, widely distributed in Tropical Africa and throughout the Tropics.

A fodder grass, both grazed and stacked in India; but opinions differ as to its qualities, "not much relished by cattle" (Coldstream), "considered a good fodder-grass in Ajmere" (Duthie) (Dict. Econ. Prod. India).

An annual, with erect culms, 3 ft. high or more.

Rottboellia, Linn.

Rottboellia exaltata, *Linn.*; Fl. Trop. Afr. IX. p. 73.

Ill.—Roxb. Pl. Corom, ii. t. 157; Lisboa, Bombay Grasses, p. 58; Engler & Drude, Veg. Erde (Pflanz. Afr., ix. 2, f. 134).

Vernac. names.—Gizazama or Gyazama, Dadawa (Hausa, *Dalziel*); Agumbogo (Aguku, S. Nigeria, *Thomas*).

Abinsi, Katagum, Sokoto in Northern Provinces and Aguku, Agolo and Obu Districts, S. Provinces, Nigeria; also known in Tropical Africa from Bagirmi and district of Lake Fittri, Abyssinia, British East Africa, Belgian Congo, Angola, Portuguese East Africa, Zanzibar, Nyasaland, etc. Introduced to the West Indies. In China, Malaya and Australia.

A horse fodder—a tall, harsh-leaved grass—Abinsi and vicinity (Dalziel, Herb. Kew; Hausa Bot. Voc., p. 46); cultivated as a forage plant, preferred by cattle, West Africa (Chevalier, Forage Pl. W. Africa, Journ. d'Agric. Trop., 1911, p. 97: Bull. Bur. Agric. Inst., Rome, June 1911, p. 1318); but said by Welwitsch to be "much disliked by cattle" (Fl. Trop. Afr., l.c.); feed for goats, Aguku District, S. Nigeria (Thomas, Herb. Kew).

Annual; culms up to 12 ft. high; found at edges of a marsh, Abinsi, Nigeria (Dalziel, No. 870, Herb. Kew).

IMPERATA, Cyr.

Imperata cylindrica, *Beauv.*; Fl. Trop. Afr. IX. p. 87.

Ill.—Beauvois, Agrost., t. 5, f. 1; Duthie, Indig. Fodder Gr. N. India, t. 15; Engler & Drude, Veg. Erde (Pflanz. Afr.), ix. 2, p. 189, f. 133; Notizbl. Bot. Gart. Berlin, App. xxii. 7th Nov. 1909, p. 48; Brown & Hunter, Pl. Uganda, p. 76 (*I. arundinacea*).

Vernac. names.—Lalang or Alang Alang (Malaya, *Beccari*); Mao Tsão (Ssũchuan, China, *Hosie*); Blady Grass (N. Australia, *Maiden*); Spear Grass (S. Nigeria, *Johnson*—specimen in Herb. Kew); Lusanke (Uganda, *Brown & Hunter*).

var. **Thunbergii,** *Durand & Schinz*; Fl. Trop. Afr. l.c. p. 88.

Vernac. names.—Toha or Tofa (Hausa, *Dalziel*); Ekan (Lagos, *MacGregor*); Sulunji, Kalat (Sierra Leone, *Thomas*).

Lagos, Nupe, Lokoja, Yola, Okuni, Inkum (Cross River) in Nigeria and widely distributed in Tropical Africa.

var. **Koenigii,** *Durand & Schinz* [*I. arundinacea*, Hook. f., Fl. Br. India, vii. p. 106, partly]; Fl. Trop. Afr. l.c.

Vernac. name.—Ekan (Lagos, *MacGregor, Dodd*).

Lagos, and widely distributed in Tropical Africa and warm countries. Although there are several varieties, it is proposed to consider them here as one for practical purposes. Used for roofing houses, Lagos (MacGregor, Herb. Kew); for thatch [culms] and stuffing cushions [the white cotton-like floss of the flower-spike] in Hausa land (Dalziel, Hausa Bot. Voc. p. 93—. *I. arundinacea*); for thatching in Siam, where the Natives cut the grass yearly for the purpose (Kew Bull. 1912, p. 429—*I. arundinacea*), as a roofing material in the Malay States (Spring Agric. Bull. F.M.S., Jan. 1917, p. 135); for thatching, India and Ceylon (Watt, Dict. Econ. Prod. India—*I. arundinacea*). It is reported to be of little use as a fodder—except when quite young, or when no other forage can be obtained (l.c.); it produces after being burnt a large quantity of succulent feed, relished by stock,

and when kept eaten down in the spring and not allowed to become rank it affords a good feed for a considerable time in Australia (Maiden, Useful Nat. Pl. Austr., p. 92—*I. arundinacea*).

This grass has been experimented with as a paper-making material. It was reported in 1908 to be of doubtful commercial value when compared with other materials for this purpose, but that it might be used in association with pulp derived from other sources (l.c. 1910, p. 205; Agric. Bull. Fed. Malay States, Dec. 1908, p. 587), and later results obtained by the chemical analysis show that it gives a good quality cellulose, suitable in every way for the manufacture of paper (Kew Bull., 1909, p. 57). Experiments show that it gives a good yield of pulp, which bleaches readily, and that when used alone it would be suitable for making high-class printing papers, and in conjunction with 20 per cent. of rags would produce excellent writing-paper (Bull. Imp. Inst., 1918, p. 271). There is a sample of paper-pulp or "half-stuff" of "Lalang-grass" from Singapore (Ridley, 1894) in the Museum at Kew. As a paper-making material the plant is fully discussed in Kew Bull., 1909, pp. 55–59.

A perennial; culms 1½–4 ft. long (Fl. Trop. Afr., l.c.), 2 ft., Nupe (Barter, Herb. Kew); a stiff-leaved grass with a white, cottony flower-spike, growing in fields and elsewhere after harvest or burning, especially in damp situations, N. Nigeria (Dalziel, l.c.) and found in moist, stiff pasture ground, India (Watt, l.c.), on rich alluvial land, Australia (Maiden, l.c.), more or le s of a pest on rubber plantations, Malaya; a great pest to cultivation, Nupe (Barter, l.c.) and a well-known pest in clearings, Yola (Dalziel, Herb. Kew). The plant is a striking one when in flower—"low valleys of this appear like distant snow-fields" in Nupe (Barter, l.c.) and "about April or May, the fields, roadsides and railway embankments become white with its silky heads," in India (Watt, l.c.).

Ref.—"Notes on Soils and Lalang Grass," Agric. Bull. Straits and Fed. Malay States, May 1893, pp. 73–77.——"Lalang Grass Possessing Good Paper-making Qualities found on Rubber Plantations," Clayton Beadle, l.c. vi. May 1908, pp. 177–179—from "Paper Makers' Journal."——"Lalang (*Imperata arundinacea*) as a Paper-making Material," Stewart Remington, l.c. December 1908, pp. 585–587.——"Lalang Grass as a Paper-making Material," Remington & Bowack, in the "World's Paper Trade Review," Oct. 30th, 1908, pp. 713–715.——"Lalang Grass (*Imperata arundinacea*)," Hillier, in Kew Bull., 1909, pp. 55–59.——"Lalang Grass (*Imperata cylindrica*) used in Paper-making," Remington, in Agric. Bull. Straits and Fed. Malay States, ix. March 1910, pp. 85–90.——"Utility of Lalang as a Roofing Material," Spring, l.c., Jan. 1917, p. 135.——"Lalang Grass (*Imperata arundinacea*)" in "Tropical Grasses as Paper-making Materials," Fed: Malay States, Bull. Imp. Inst., 1918, pp. 271–273.——Ekong (*I. cylindrica*); "Nigerian Grasses for Paper-making," l.c. 1921, p. 272.

Saccharum, Linn.

Saccharum officinarum, *Linn.*; Fl. Trop. Afr., IX. p. 96.

Ill.—Bentley & Trimen, Med. Pl. t. 298; Duthie, Field Crops, t. 14; Church, Food Grains, India, p. 77; Journ. Linn. Soc. xxviii. (1891), t. 33; Koehler, Med. Pflan. i.; Engler, Pflanz. Ost. Afr. Th.B. p. 75; West Indian Bull. xii. 1912, p. 378 (vars., showing types of eye-buds—"White Transparent," "Bourbon," "White Tanna," "Samsara," "D. 145 White Sport"); Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 257, f. 156, and numerous other works.

Vernac. names.—Rake (Hausa, Kano, *Dalziel*); Deke (Hausa, *Dudgeon*); Sugar Cane, Ribbon Cane (Gulf States, *Ball*).

Grown in Nigeria, Gold Coast, other parts of West Africa and Tropical Africa—chiefly by the Natives for chewing; in Egypt, Natal, Mozambique, Cuba, British India, Java, Mauritius, Formosa, Philippine Islands, Queensland, New South Wales, Fiji, West Indies, Guiana, Surinam, Brazil, Argentina, Venezuela, Peru, Louisiana, Central America, Porto Rico, and Hawaii, on a commercial scale, imported into the United Kingdom to the extent of more than 800,000,000 lb. annually. The chief producers are Cuba, Java and British India, where the annual production exceeds 1,000,000 tons. Some 40,000 tons are manufactured in Portuguese East Africa—three estates situated within 100 miles of the mouth of the Zambesi River, it is stated, producing of this amount some 10,000 tons each in an average season (West India Comm. Circ., April 28th, 1921, p. 165).

The sugar prepared from the juice of the cane is an important food throughout the world. The molasses (the liquid remaining after separation of the sugar crystals) is also used for food purposes, and mixed with other suitable substances—"groundnut shells" (*see* "Soga Meal," under *Arachis hypogaea*, p. 202), Crushed Sugar Cane or "Megasse" (sold as "Molascuit") and Sphagnum Moss (sold as "Molassine"), it is a recognised cattle feed. In Louisiana a complete ration for a mule is given as 15 lb. molasses, 15 lb. chaffed hay and 2 lb. of cotton-seed meal, well mixed together (Agric. News, Barbados, Jan. 9th, 1909, p. 12). In Mauritius and many other sugar-producing countries during the harvesting season, the tops of the cane are used for feeding both horses and cows and in some instances the cane is cut before it becomes woody, for forage. The green stalks are used for chewing by the Natives and are fed to cattle in Nigeria (Dudgeon, Agric. & For. Prod., W. Africa, p. 151). The "Uba" cane, grown largely in Natal for sugar, is also recommended there and in other parts of South Africa for forage especially in uplands where the growing for sugar becomes less profitable (Transv. Agric. Journ. iii. 1904, pp. 120, 121). A sugar cane called "Zwinga," with numerous slender stems, is cultivated in the Southern United States—introduced from Japan in 1878—for the extraction of syrup and as forage—as dry fodder, silage

or pasture (Piper, Forage Pl. pp. 247–249; and *see* "Japanese Cane for Forage," Farmers' Bull. U.S. Dept. Agric. No. 457, 1911, pp. 8–11).

A spirit is distilled chiefly from the molasses in many countries where the sugar-cane is grown; the production of rum is a well-known leading industry in Jamaica (Cousins, Bull. Dept. Agric. Jamaica, i. April 1909, pp. 57–65); "Natalite"—specially adapted for use in combustion engines is prepared in Natal Agric. News, Barbados, March 23rd, 1918, p. 88); and in general the spirit is recommended as a convenient source of power and as an illuminant in the tropics (Kew Bull. 1912, p. 122; West India Comm. Circ. June 21st, 1904; Agric. News, Barbados, July 16th, 1904, p. 226). Molasses in Madeira (imported from the West Indies and Demerara) are employed in the manufacture of neutral spirit for the treatment of Madeira wines (l.c. Oct. 24th, 1903, p. 348).

A wax, obtained to the extent of 10 per cent. or more, from the so-called "filter-dirt"—a waste product of the Java sugar industry, is found when refined to closely resemble that of "Carnauba" (*Copernicia cerifera*, Mart.) of Brazil (*see* Wijnberg, "The Wax of the Sugar-cane and the Possibility of its Technical Production"; Kew Bull. 1910, p. 355). It is reported that a number of factories in Natal extract the wax from the sugar-cane (chiefly "Uba" cane) press-cake by means of benzene, commonly obtaining 14 per cent. and sometimes 17 per cent. of wax. Experiments in Mauritius show that the wax found in the dry press-cake may vary from 1·8–16·8 per cent.; but mostly the yield is 10 per cent., that seedling canes give higher yields of wax than "Tanna" varieties, and that virgin cane is richer in wax than ratoons (Inter. Sugar Journ., 1916, pp. 18, 23; Bull. Imp. Inst., 1916, p. 294). The manufacture of wax is on an extensive scale in Natal, where the Natal Cane By-products Co., Ltd., have a large factory, and several hundred tons have been put on the London market at a remunerative price (Agric. News, Barbados, March 23rd, 1918, p. 89).

The "Megasse" or "Bagasse," the refuse from the sugar-cane factories is commonly used for fuel, for which purpose the value may vary according to local conditions; it is often more economical to burn it, and on many estates it may be the only fuel available—taking the "Lahaina" cane referred to below as an example, the thermal value of this has been found to be 7563 B.T.U. (British Thermal Units) as received, moisture 7·04, and 8135 B.T.U. on a dry basis, and a further general calculation is that Hawaiian bagasse, with an average of 45 per cent. of water would have an effective heating value of 2909 B.T.U. per lb. of green bagasse (Norris) and Cuban bagasse—47 per cent. of water, an effective heating value of 3848 B.T.U. (Meyers) (Little, Inter. Sugar Journ., Sept. 1920, p. 505, and see the same Journal, Jan. 1892, "Combustion of Finely-divided Bagasse," pp. 28–31; Jan. 1903, "Comparison of Fuel Values," including

"Bagasse," pp. 15–17; "Bagasse as a Source of Fuel," by E. C. Freeland, Jan. 1918, pp. 16–18; "Megass Furnaces," by R. Lloyd, June 1907, pp. 280–286). The ash of bagasse is estimated to amount to about 5 cwt. from each 100 tons of cane crushed and burned (Lock & Newland, "Sugar: Handbook for Planters, etc," p. 48). Where this material is not wanted for fuel or for a surplus, the manufacture of paper has been for many years an alternative suggestion; there are specimens of paper in the Museum at Kew presented by Mr. Thos. Routledge 1875, and from Demerara (Col. & Indian Exhib.), 1886, but comparatively little success appears, so far, to have been met with, and in no case can it be found that the "half stuff" (the usual condition recommended for export) or paper made therefrom has been received in commercial quantities in this country. In Cuba it is reported that paper of good quality is being made for local use (Journ. Roy. Soc. Arts, "Manufacture of Paper from Sugar-Cane Bagasse," Dec. 31st, 1915, p. 132; Agric. News, Barbados, May 6th, 1916, p. 156). Experiments have been made in Trinidad, where it has been found that the best results have been obtained from a blend of megasse, bamboo and Para grass [*see* p. 822, *Panicum muticum*, Forsk.], and for use locally for wrapping papers the manufacture is recommended (Bull. Imp. Inst., 1910, pp. 151, 152) in Hawaii (Little, "The Paper Making Qualities of Hawaiian Bagasse," Inter. Sugar Journ., Aug. 1920, pp. 453–460; Sept. 1920, pp. 505–508) and Malaya (Remington, Bowack and Carrington in Agric. Bull. Straits and Federated Malay States, ix. March 1910, "Megasse in Paper Making," p. 85).

In Nigeria the cultivation of Sugar Cane is confined to small patches or strips of land on the edges of rice-fields, where it may be said to be under irrigation, or in low damp places upon ridges, the variety in the Kano district has a small reddish stem (Dudgeon, l.c., N. Nig. Gaz., July 31st, 1909, p. 158). In Kontagora "Rake" is grown only at the sides of streams and in moist situations; it is cut in November and after, about the same time or earlier than the guinea-corn is harvested; no care is taken to secure thick succulent culms, and the plant is allowed to flower freely (Dalziel, Bull. Imp. Inst., 1907, p. 260). Similarly in the Southern Provinces the native-grown plant appears to be of comparatively little importance, and the production of sugar is not known amongst the Natives; but some efforts are being made both to start local production of sugar and to improve the cultivation—soft sugar of local manufacture could be obtained (1918) from the Church Missionary Society, Zaria, at 4*d*. per lb. for "soft molasses sugar" and 5*d*. per lb. for "crystalline Demerara type," purchasers furnishing their own tins, boxes, etc. for packing (The Nigeria Gaz. Suppl., 21st March 1918). In January 1914, six varieties of Barbados pedigree seedling canes were introduced from the West Indies by the Department of Agriculture, Northern Provinces, they

included B 376, B 208, B 6308, B 3922, BA 6032 and B 6450, all surviving the journey with the exception of the last named; propagated at Zaria they were afterwards distributed to the Native farmers (Lamb, Ann. Rep. Dept. Agric. N. Nig., 1914, p. 3; Rae (at Maigaina), p. 13), and in 1917 it was reported the demand for these West Indian Sugar Canes continued to increase, 3200 canes of B 6308 had been distributed, and that this and the other varieties mentioned were being propagated on an increased scale (Rae, l.c. 1917, p. 10). These varieties were also transmitted to the Department of Agriculture in the Southern Provinces, and were being propagated, together with the variety commonly grown by the Natives at Ibadan (Johnson, Ann. Rep. Dept. Agric. S. Prov. Nigeria, 1917, p. 7) where in 1918 a small plot of native cane yielded 15·2 tons per acre; but in 1919 as a first ratoon crop only 3·44 tons per acre, and of the introduced canes, the yield (1919) was at the rate of 28·24 (BA 376), 7·96 (B 6308), 22·22 (B 3922), 29·12 (a West Indian Cane), and 16·97 (a common cane from the N. Provinces) tons per acre respectively. The stands were grown 6 ft. apart, in rows 3 ft. 6 in. apart (l.c. 1919, p. 8). It has been stated that British Nigeria is quite a new proposition in the world's supply of sugar, to which, so far, the Colony has not contributed and it is suggested that 650,000 tons of sugar would ultimately be within the capabilities of the country (Inter. Sugar Journ. 1916, pp. 150, 151—under " A Plea for our Colonies ").

On the Gold Coast, improved varieties introduced from the West Indies prior to 1908 and later, including B 208 mentioned above, a patch of B 147 and the " White Transparent " variety were being experimented with and it was hoped that if some simple means of manufacturing crude sugar was introduced a sufficiency of sugar for local consumption might be grown (Ann. Rep. Dept. Agric. Gold Coast, 1908, p. 15; 1910—Coomassie Agric. St. for 1909, p. 23). In Uganda improved varieties of cane from various parts of the world were under experimental cultivation (Ann. Rep. Dept. Agric., Uganda, 1915–16).

Other notes might be given to show that sugar production is open to considerable advancement, not only in Nigeria but in Tropical Africa, although generally the cultivation in the main appears to be well understood. New varieties are raised from seed, afterwards selected by chemical analysis, weight of stems, etc., in comparison with standard varieties [*see* Kew Bull., 1888, " Seedlings of Sugar Cane at Barbados," pp. 294–296; 1891, " Production of Seed and Seminal Variation in the Sugar-Cane," pp. 10–24; 1894, " Seminal Variation in the Sugar-Cane," pp. 84–86; " Improvement of Sugar-Cane by Chemical Selection of Seed-Canes," pp. 86–96; 1899, pp. 45–46; " Harrison on Cane Variation," Inter. Sugar Journ., Aug. 1909, pp. 365–367, with special reference to the " Variations of B 208 "; various papers in the West Indian Bull., by Lewton-Brain, iv. No. 1, pp. 63–73; Stockdale, vi. No. 4, 1906, pp. 394–402; Morris & Stockdale,

vii. No. 4, 1906, pp. 345–373; Harrison, Stockdale & Ward, xiii. No. 2, 1912, p. 188]; but in field practice the plants are always propagated by cuttings, tops of selected cane or, sometimes, whole canes, being cut up and planted somewhat after the manner of potatoes, or carefully laid in, properly spaced and regulated by hand. In Cuba the prevailing system is to plant the cane in hills about 3 ft. apart, in rows 4½–5 ft. apart, the soil is prepared and cultivated the first season, but no further tillage is given (Agric. News, Barbados, May 12th, 1906, p. 146); in this island the variety known as "Crystalina"—one of the established commercial varieties, is the one most generally grown; it is said to succeed with a minimum of care and under conditions where other varieties would fail (Deerr, West Indian Bull., xiv. 1914, p. 258); tops [cuttings of "White Transparent" variety in the Museum at Kew] are chiefly used in the West Indies (Agric. News, Barbados, April 24th, 1915, p. 131), carefully selected from sound ripe canes; the leaves are cut off low enough to include the terminal bud, leaving a piece of the cane about 10 in. long, having two or three healthy lateral buds or eyes. It is recommended to soak the cuttings for an hour or two in slaked lime and water (2 lb. of lime to a gallon of water) in order to destroy as many animal and vegetable parasites as possible. The cuttings are planted 4½ by 5 ft. or 5 by 5 ft., dibbled in with an iron bar or drill, deep enough to take the head of the piece planted just below the level of the ground; the eyes burst into leaf in about 7–14 days (Watts, Manual for Sugar Growers, p. 43). Tops are recommended in the Godaveri Delta, some varieties such as "Seema" will only grow from such, and about 10,000 sets or less are considered sufficient for an acre—planted in rows and covered by 2–3 in. of earth (Barber, Agric. Journ. India, ii. Jan. 1907, "Sugar Cane Cultivation in the Irrigated Lands of the Godaveri Delta," pp. 33–41). The canes are harvested when growth is complete and they begin to change colour, which may be in about 12 months from the time of planting—the "Bourbon" as a plant cane is said to arrive at maturity in 15–16 months and as a ratoon in 12 months (Inter. Sugar Journ., Aug. 1909, p. 390), and the "Uba" in Natal is stated to require 22 months from plant canes to reach full maturity and 20 from ratoons (l.c. Jan. 1920, pp. 14, 15) or 18–24 months, and in Portuguese East Africa ratoons are cut after about 12 months (*see* Morris, "Cane Growing in the Zambesi," *seq.*); they are cut as close to the ground as possible and conveyed without undue delay to the crushing mills. It is recommended that the cane should be received at the factory at the latest 24–36 hours after cutting, and that care must be taken not to have more cane in stock than can be worked off by the mills in 24 hours (Weinberg, "The Deterioration of Cut Sugar Cane," in Agric. Ledger, No. 6, 1903, pp. 139–146). It has been concluded from an extensive survey of experiments made all over the world, that sugar should be planted in rows

as close together as is consistent with proper cultivation with modern machinery, this distance appearing to be about 5 ft. for the thicker types of cane, such as "Cheribon," "Lahaina," "B 208," etc., and from 5½–6 ft. for the more abundantly suckering types such as the "Java Canes" the "Uba," the "Japanese Bamboo" type, etc. (Rosenfeld, Inter. Sugar Journ. Nov. 1920, p. 635). A good yield would be about 4 tons of sugar per acre; but considerable variation might be expected according to variety, climatic, soil and other conditions. Of the canes above mentioned, the "Uba" (also known as "Cavangerie" or "Kavangire")—the standard cane in Natal, in Madeira (Inter. Sugar Journ., Aug. 1909, p. 415) and in Portuguese East Africa (West India Comm. Circ., April 28th, 1921, p. 165)—has been recommended as the most suitable cane for West African estates (l.c. July 22nd, 1920, p. 216); in Jamaica, where it is regarded as resistant to disease and immune to the "Mosaic disease," it has been found to yield 26·8 tons of cane per acre—giving 17·38 per cent. sucrose (Cousins, Ann. Rep. Dept. Agric., Jamaica, year ending March 1920; Inter. Sugar Journ., Dec. 1920, p. 670) and in Natal the tonnage sometimes reaches 60 tons of cane per acre and at the highest yield it takes about 8 tons of "Uba" canes to produce 1 ton of sugar (l.c. Jan. 1920, p. 14). The chief advantages of this cane appear to be its hardiness, freedom from disease, and that it ratoons well. In some places it has been discarded as of little or no value, probably due to some unsuitable local condition; the thin canes contain much fibre, are difficult to crush, and require more powerful machinery than the thick [tropical] canes (l.c. p. 13), while in Madeira—although its purity and sucrose contents are considerably less than in the old sorts which "Uba" seems to have replaced—its powers of resistance in a much-exhausted soil is a strong recommendation (l.c. Aug. 1909, p. 415). It is suggested that if this cane is to bear out the above recommendation as the most suitable for West Africa, that experiments be made at the higher altitudes, where for instance in Nigeria it may succeed when the purely tropical canes fail. In the Zambesi river area, where this cane is grown, the rainfall varies from 30–45 in. per annum: the soil varies from a fairly stiff clay to a light sandy loam of good depth. "The fields are mostly laid out in squares with broad traces round them to enable the cultivator engines to work easily, and so that portable light lines may be laid to feed the main lines. After the land has been cleared it is double ploughed, 18–24 in. deep, by Fowler's steam cultivators. Shallow drains are then constructed 40–50 ft. apart by a special plough for surface drainage, whilst another plough ridges out the cane rows 6 ft. apart. The land is then left fallow until the rains start, when the cane plant cuttings are put in by hand and lightly covered with earth. As soon as the plants are high enough, they are weeded and moulded and kept clean until they are about 6 months old, from which time no more labour is expended

on them since the trash and leaves adhere so closely that it is almost impossible to clean them until they are burnt and cut when 18–20 months old. The yield is then 60 or more tons per acre, a large block often averaging 40–50 tons per acre. Henceforward the only tillage done is weeding and moulding for another six months, after which the canes are left to grow on their own. Each estate usually prepares some 1500 acres every dry season for planting " (Morris, " Cane Growing on the Zambesi " in the West India Comm. Circ., April 18th, 1921, pp. 165, 166). Other varieties have been tried here, but none have been found to compare with the " Uba "—it is a thin, greenish cane, with long joints and hard rind, contains 14–20 per cent. fibre and 10–14 per cent. sucrose, very hardy, ratoons splendidly, the yield from which, cut after about 12 months' growth, is from 13–30 tons per acre (l.c.).

The " Lahaina " cane has given a yield of 4–6 tons, sometimes up to 10 tons of sugar per acre in Hawaii (Kew Bull., 1894, p. 419, *q.v.* for an account of this cane, pp. 418–419), and in the same Island " Dark coloured Bamboo " has yielded 103 tons of cane and 16 tons of sugar per acre and B 208 (already under experiment in Nigeria—*see* above) has yielded 73 tons of cane giving approximately 12 tons of sugar per acre (Bull. No. 17, Div. of Agric. Hawaiian Sugar Planter's Assoc.; Agric. News, Barbados, Nov. 3rd, 1906, p. 338). The " Rose Bamboo " cane is in favour in South Formosa, where in 1908 it was anticipated that it would in a very short time entirely displace all other varieties. It yields 35 yen per kah (2·4 acres) or say 58,000 kin (77,333 lb.) (Wileman, Cons. Rep. Misc. No. 675, 1909, p. 9).

The above are but a few of the many varieties that might be grown: but for the others useful reference may be made to " Varieties of Cane, with special reference to Nomenclature," by Noel Deerr & C. F. Eckart, in Inter. Sugar. Journ., Jan. 1909, pp. 29–38; Feb. 1909, pp. 69–76. " Varieties and Races of Sugar Cane " in The Commercial Products of India, by Sir G. Watt, pp. 933–938. " Varieties," Kirby & Dudgeon, Bull. Imp. Inst. 1921, pp. 30–33, and the works enumerated below.

As some indication of the magnitude of the work required the following particulars may be of interest—an estate of 43,000 acres in Central Cuba meets the requirements of a sugar factory (built by Messrs. Duncan Stewart & Co., Ltd., of Glasgow) with a capacity for dealing with over 6000 tons of cane per day; it is intersected by more than 60 miles of railroad, with a full complement of heavy locomotives and cane and sugar cars. The milling plant consists of three trains of 36-inch mills, two trains being 6 ft. wide and the third 7 ft. wide each with a Krajewski crusher. The steam generating plant consists of 24 multitubular steam boilers, each 8 ft. in diam. by 22 ft. in length (Agric. News, Barbados, March 23rd, 1918, p. 89). Another factory—Usine St. Madeline, in Trinidad—is reported to grind the canes grown on seven estates, covering some

15,800 acres—8000 of which are under cultivation; these estates are connected by 53 miles of railway with 7 locomotives constantly employed; 1800 tons of cane are crushed per day—cut by men with cutlasses and headed out by labourers to trucks on to the nearest rails—and 1000 tons of sugar per week are turned out during the season, or some 14,000 tons in all (Inter. Sugar Journ., July 1909, p. 321). On three estates within 100 miles of the Zambesi river (cultivating "Uba" as above mentioned) the output of sugar averages in a season 10,000 tons each; the factories are well equipped with up-to-date milling plants, each having a Krajewski and four mills of three rollers, making 14 rollers in all [a similar plant is at St. Kitts—*see* Kew Bull. 1912, p. 208]; there are also Ramsey Macerators, Quadruple Evaporators, Vacuum Pans, Centrifugals, etc., and two estates have also large irrigation works, the cost of irrigation running from 20*s*. to 30*s*. per ton of sugar (Morris, l.c.).

The subject is almost entirely one for the sugar expert, and in view of the world-wide importance, it is not surprising to find an extensive literature, the following references to which are confined to books.

Ref.—The Practical Sugar Planter, Wray, pp. 1–415 (Smith, Elder & Co., London, 1848).——The History of Sugar and Sugar Yielding Plants, Reed, pp. 1–206 (Longmans, Green & Co., London, 1866).——La Canne à Sucre, Delteil, pp. 1–118 (Challamel Ainé, Librairie Algérienne et Coloniale, Paris, 1884).——Sugar Growing and Refining, Lock, Wigner, & Harland, pp. 1–752 (E. & F. N. Spon, London, 1885).——Sugar: Kinds of Sugar which may be classed as Refined, Miller, in the Agric. Ledger, No. 6, 1893, pp. 1–3.——An Introductory Manual for Sugar Growers, Watts, pp. 1–151 (Longmans, Green & Co., London & New York, 1893.——Chemical Composition of Sugar Cane and Raw Sugars, Leather, Agric. Ledger, No. 19, 1896, pp. 1–21, and in No. 3, 1897, pp. 1–35.——Sugar Cane, Stubbs, pp. 1–208 (Bureau of Agric., State University, Baton Rouge, Louisiana, 1897).——The Sugar Cane in Egypt, Tiemann, pp. 1–74, illustrated (Inter. Sugar Journ., Altrincham, 1903).——Science in Sugar Production: An Introduction to the Methods of Chemical Control, Heriot, pp. 1–104 (Norman Rodger, Manchester, 1907).——Sugar: A Handbook for Planters and Refiners, (1st ed., Lock & Newlands 1888), Newlands Bros., pp. 1–876 (E. & F. N. Spon, Ltd., London, 1909).——Cane Sugar and Its Manufacture, Geerligs, pp. 1–350 (Norman Rodger, Manchester, 1909).——Report for the year 1908 on the Sugar Industry of South Formosa, Dip. & Cons. Rep. Japan, No. 675, Misc. Series, 1909, pp. 1–19.——The Wax of the Sugar-cane and the Possibility of Its Technical Production, Wijnberg, pp. 1–198, in Dutch (Amsterdam, 1909).——Cane Sugar: A Text Book on the Agriculture of the Sugar Cane, Deer, pp. 1–592 (Norman Rodger, Manchester, 1911).——The World's Cane Sugar Industry, Past and Present, Geerligs, pp. 1–399 (Norman Rodger, Manchester,

1912).——Plantation White Sugar Manufacture, Harloff & Schmidt, pp. 1–138 (Norman Rodger, Manchester, 1913; Revised and Enlarged, 3rd ed., 1917, J. H. De Bussy, Amsterdam); translated from the Dutch by James P. Ogilvie.——The Cane Sugar Factory: A Catechism of Cane Sugar Manufacture for the Use of Beginners, Scard, pp. 1–118 (The West India Committee, London, 1913).——Notes on Experiments with Sugar-Cane at Sabour, Somers Taylor, Agric. Research Inst., Pusa, Bull. No. 37, 1913, pp. 1–17.——Notes on Cane Crushing in the United Provinces, Clarke, Hussain & Banerjee, Agric. Research Inst., Pusa, Bull. No. 42, 1914, pp. 1–12.——The High Price of Sugar and How to Reduce It, Smith, pp. 1–54 (Bale, Sons & Danielsson, Ltd., London, 1916).——Sulphitation in White Sugar Manufacture, Maxwell, pp. 1–72 (Norman Rodger, Manchester, 1916).——A Handbook for Cane Manufacturers and Their Chemists, Spencer, pp. 1–529 (John Wiley & Sons, New York; Chapman & Hall, London, 1916).——Sugar-Cane Culture for Sirup Production in the United States, Yoder, U.S. Dept. Agric. Bull. No. 486, 1917, pp. 1–45.——Chemical Control in Cane Sugar Factories, Geerligs, pp. 1–140 (Norman Rodger, Manchester, 1917).——Sugar and the Sugar-Cane in the Gurdaspur District, Barnes, Agric. Research Inst., Pusa, Bull. No. 69, 1918, pp. 1–100.——The International Sugar Journal, issued monthly (Publishing Offices, Altrincham, Manchester).——The Australian Sugar Journal, issued monthly (Publishing Offices, The Outridge Printing Co., Ltd., Brisbane, Queensland).

Saccharum spontaneum, *Linn.*; Fl. Trop. Afr. IX. p. 95., var. **aegyptiacum,** *Hack.* l.c.

Ill.—Palisot de Beauv. Fl. Oware, Benin, ii. t. 103 (*S. spontaneum*); Duthie, Fodder Gr. N. India, t. 52; Symonds, Indian Grasses, t. 44.

Vernac. names.—Kyamro, Kyauro, Kibiya, Sheme (Hausa, *Dalziel*); Kásá (Sanskrit, *Watt*); Kosa, Kas, Kus, Kayara, etc. (India, *Watt*).

Niger River, Borgu, Katagum in Nigeria, Sudan, Nyasaland, and extending through Lower Egypt to Syria.

The species is found throughout the warmer parts of India and Ceylon, and distributed to Southern Europe and warm regions of the Old World (Fl. B. India, vii. p. 119).

Stems commonly used for arrow-shafts, Northern Nigeria (Dalziel, Hausa Bot. Voc. p. 69), and highly prized for the manufacture of native pens, India (Watt, Comm. Prod. India, p. 930). Largely used as a thatching material, and the leaves are made into ropes, mats, etc. in India (Watt. Dict. Econ. Prod. India) where it is a favourite fodder for buffaloes, and in the young state fed to elephants. It is also said to be relished by camels and goats; but except while very young it "is so very coarse that cattle do not eat it" (l.c). The Indian plant has also been under experiment as a paper-making material; but the results so far (1918) are not definite as to the value (Ann. Rep. Bd. of

Sci. Advice, India, for 1916–17; Bull. Imp. Inst., 1918, p. 577; and see also "Report on the Investigation of Savannah Grasses as Material for Production of Paper-Pulp," by W. Raitt, Indian Forest Record, v. part 3, 1913).

A tall perennial grass, with culms up to more than 12 ft. high, coated with wax below the nodes (Fl. Trop. Afr., l.c.); white plume-like flowering panicle on river-banks and wet places, Nigeria (Dalziel, l.c.); common on the sand-banks of the Niger from the sea up to Borgu (Barter, Herb. Kew). It appears to be more or less of a pest in cultivated lands in India. Watt (l.c.) recommends for eradication "to plough up the land and smother the roots with a vigorous rainy-season crop"; and it is also said that after a certain number of years this grass will wear itself out and disappear. The yield of green grass per acre of *S. spontaneum* from a virgin crop has been found to be 21,221 lb., and cut nine months later, a crop of 11,736 lb. was obtained, the difference in yield being attributed chiefly to the grazing of the new shoots by buffaloes, and to the restriction to nine months of the growing period (Ann. Rep. Bd. Sci. Advice, l.c.).

Ref.—"*Saccharum spontaneum*," in Dict. Econ. Prod. India, Watt, vi. part IIA, 1893, pp. 11–12, and in Comm. Prod. India, p. 930.——"The Origin of the Sugar Cane," Barber, in the Inter. Sugar Journ., xxii. 1920, pp. 249–251, with special reference to *Saccharum spontaneum*.

SORGHUM, Pers.

Sorghum Ankolib, *Stapf*; Fl. Trop. Afr. IX. p. 135.

Vernac. name.—Ankolib (Nileland, *Stapf*).

Abyssinia, Eritrea, Italian Somaliland.

Grown for its sweet canes, which are chewed; cultivated in Abyssinia (Schweinfurth, Herb. Kew).

Sorghum arundinaceum, *Stapf*; Fl. Trop. Afr. IX. p. 114.

Vernac. names.—Taiski, Istanhe, Gawosge (Sierra Leone, *Thomas*); Mosonde (Portuguese E. Africa—Sechuana, *Kirk*).

Nupe, Cameroons, Niger River region, and widely distributed in Tropical Africa, from Sierra Leone to Angola in Upper and Lower Guinea, extending to Damara Land, Uganda, East Africa, also in South Africa, and introduced to Brazil.

Grain eaten by the people in times of famine (Kirk, Herb. Kew).

Annual, with culms up to 12 ft. high; a fine ornamental grass, 6–7 ft. high, Aburi, Gold Coast (Johnson, Herb. Kew).

Sorghum bicolor, *Moench*, Method. Pl. Horti. Bot., p. 207; var. **obovatum,** *Stapf*, Fl. Trop. Afr., IX. p. 127.

Angola, and occasionally cultivated in the Mediterranean; in Madeira, Australia, West Indies and Brazil. There is no record from Nigeria; but judging by the known distribution it is not

improbable that it occurs there, and together with the more useful var. **technicus**, Stapf, it does not seem desirable to omit them.

An annual; culms up to 14 ft. high; cultivated in the countries above mentioned for the grain.

Sorghum bicolor, *Moench*, l.c. var. **technicus,** *Stapf.*

An annual; stems 10–15 ft. high—standard variety; 3–6 ft. high—dwarf variety (Ball); 8–10 ft. (Heuzé); dry, pithy, yellow (when ripe), $\frac{1}{4}$–$\frac{3}{4}$ in. thick at from 4–6 in. from the top of the short rachis—from which the slender brush fibres or seed heads (50 or so) arise compactly to a length of from 12–18 in. (specimen of "Florence Whisk" in Mus. Kew), 10–28 in. (Ball), 8–10 in. (Heuzé); nodding slightly in the growing plant. Leaves and young plant resembling "Corn" (*Zea Mays*). Seeds about the size of ordinary "Guinea Corn," reddish brown (in specimen seen), yellowish, reddish or blackish (Heuzé).

Ill.—Heuzé, Pl. Industr. i. p. 294, f. 43 (Sorgo à balais); Bailey, Cycl. American Agric. ii. f. 309 ("Standard" or tall broom-corn), f. 809 (seed-head or brush); Hartley, Farmers' Bull. 174, 1903, p. 12, f. 2; Queensland Agric. Journ. xxvi. May 1911, p. 235, f. 5 ("White Indian" variety); Montgomery, Corn Crops, p. 332, f. 115, p. 335, f. 116; Journ. Roy. Soc. Arts, lxi. 1913, p. 348 (Photomicrog., x, 45—"Broom-Corn Stalk").

Broom-Corn, Venetian Whisk, Florence Whisk.

Cultivated in the United States, West Indies, Italy, France, Spain, Cyprus, Tunis, Queensland and N.S. Wales; experimentally in Nyasaland.

The heads are used chiefly for brush- or whisk-making, and the seed when allowed to develop may be used for feeding poultry & stock; the best material for brushes being cut before the seed is fully formed. To obtain seed for sowing it is advisable to set apart a special plot from which to collect it when mature. The plant has little value for forage. The cultivation is much the same as for any other annual Sorghum, greater care, however, being necessary to space the plants regularly and to grow the crop uniformly. Seed is sown at the rate of 2 quarts to an acre, germinating 95 per cent. (Hartley, l.c. p. 13), or from 6–8 lb. per acre in rows 3–3$\frac{1}{2}$ ft. apart, and the young plants thinned out to 3 or 4 inches apart (West Indian Bull. vii. 1906, p. 222); drilled in rows 3 ft. apart for dwarf varieties (4–6 ft.) 3$\frac{1}{2}$ ft. apart for standard varieties (12–15 ft.), the same methods of treatment as for Indian corn being recommended. Harvesting is advised when the plant is just past full bloom, and while quite green; the brush is said to lose colour and to become brittle if allowed to ripen, the selling price for such being less than one-half that of high-grade stock, the 10–20 bushels of seed per acre that may be secured by the delay in cutting does not seem to be sufficient to compensate for the loss in quality of the brush. Standard broom-corn is first

"tabled" and the heads are then cut by hand—the stalks it is recommended should not exceed 6 in. in length (Agric. Gaz. N.S. Wales, May 2nd, 1911, p. 437), afterwards threshed and the brush stored in drying sheds in thin layers about 3 in. deep for about three weeks, when it is piled in bulk until thoroughly dry. Dwarf varieties—" Dwarf," " Acme," etc., are harvested by pulling or jerking the heads from the standing stalks and piled between the rows or between the stalks in the row ready for removal to the thrasher or rick; it is recommended to be cut at any time from the beginning of the blooming until the seed is in the early dough stage, and while the brush material is of the desired natural pea-green colour throughout (Rothgeb, *seq.* p. 8). It is then graded—according to colour and length—and put up into bales of 300–400 lb. in weight (Montgomery, l.c. p. 334), a cotton press is recommended for this purpose. The yield is estimated at from 500–800 lb. of brush per acre in the United States; 900–1300 lb. of clean brush and 25–30 bushels of seed per acre in Australia (West Indian Bull., l.c. p. 228). The average yield of fibre in Queensland is 600 lb. of broom and 1500 lb. of seed per acre within four months after sowing, while a second crop of 500 lb. of broom per acre is obtained three months later (Queensland Agric. Journ., xxvi. May 1911, p. 245; Agric. News, Barbados, May 27th, 1911, p. 170); the supply from 200 acres amounted to 139,772 lb., value (1910) £1,455; the demand in this colony at the same period required imports of broom to the value of £8,000 yearly (l.c.). The production in N.S. Wales (1904) from 2212 acres, was 16,449 lb. of broom—average 8 cwt. per acre, and the yield generally is estimated at from 10–15 cwt. of clean marketable brush and 25–30 bushels of seed per acre (Queensland Agric. Journ., l.c. p. 245; West Indian Bull., l.c. p. 225).

Samples of " Broom-Corn " brush grown at the Government farm, Zomba, Nyasaland, were reported on as suitable for making brooms, and marketable in London if prepared according to the required conditions—not more than 2–3 in. of stem, brush straight, of uniform length, and composed of stiff, stout stalks, preferably of a golden yellow colour (Bull. Imp. Inst., 1915, p. 202).

The variety grown in Tunis is the half-red broom Sorghum from Provence. The seed is drilled on well freshly cultivated ground from April 15th to May 15th, in lines about 2 ft. 6 in. apart and with 1–1 ft. 3 in. between the plants. The yield per acre is 10–12 cwt. of straw and, theoretically, 24 cwt. of seed; but in practice much less is obtained because of the sparrows, which take the grain and are most difficult to control. France grows little broom Sorghum, that used there comes almost exclusively from Italy; the principal importers are in Vaucleuse. The straw is of two kinds—large and small; the small is much cheaper and is used to fill out the interior of the brooms; the large is used for the covering, it fetched prices of recent years

of from 10*s.*–16*s.* per cwt., and at present (1916) it is worth 26*s.* per cwt. (Bull. Mensuel de l'Office du Gouv. Tunisien, Paris, x. Sept.–Oct. 1916, pp. 70, 71 : Bull. Bur. Agric. Inst., Rome, viii. Jan. 1917, pp. 72, 73). In Queensland, three classes of brush are distinguished in the trade—" Inside," generally not more than 17 in. long, used for forming the inside of the broom; " Cover," 17–20 in. long, for covering the inside and also for forming the shoulders; and " Hurl," ranging from 20–25 in. in length, fine and straight for the outside and finished covering of the broom. About $1\frac{1}{2}$ lb. of brush are required to make an ordinary broom, and the grades are used in about equal proportions (Queensland Agric. Journ., l.c. p. 231). In Cyprus the cultivation of broom-corn (" tchihri " or " skoupa ") has been extended, and a good number of brooms of very fair quality are now locally made; the seed is used as food for chickens, and the plant is said to grow well on irrigated land (Bull. Imp. Inst. 1919, p. 529).

Ref.—" Culture of Broom-Corn in the United States and the Manufacture of Brooms," The Technologist, i. 1861, pp. 239–244. ——" Broom Corn or Millet (*Sorghum Dhurra*) " in Trop. Agric., Simmonds, pp. 339, 340 (E. & F. N. Spon, London, 1877).—— " Broom Corn (*Sorghum dura*) " in Spon's Encycl., Div. II. pp. 542, 543 (E & F. N. Spon, London, 1880).——" Sorgo à Balais (*Holcus Sorghum*) " in Les Pl. Industrièlles, Heuze, i. pp. 293–300 (Libr. Agric. de la Maison Rustique, Paris, 1893).——" Broom Corn (*Andropogon Sorghum vulgaris*)," in Report No. 9, 1897, Dodge, U.S. Dept. Agric., Fiber Investigations, pp. 59, 60.—— " Broom Corn," Hartley, U.S. Dept. Agric. Farmers' Bull. No. 174, 1903, pp. 1–30, illustr.——" Cultivation of Broom Corn," West Indian Bull., vii. No. 3, 1906, pp. 221–225; abstract in Agric. News, Barbados, v. Dec. 15th, 1906, p. 391. ——" Broom Corn," Warburton, in Cycl. American Agric., Bailey, ii. 1907, pp. 216, 217. ——" Broom Millet," Marks, in Queensland Agric. Journ., xxvi. May 1911, pp. 231–246, illustr. (reproduced from a Bulletin issued by Dept. Agric. N.S. Wales).——" Broom Millet," in Agric. Gaz. N.S. Wales, xxii. May 2nd, 1911, pp. 436, 437, including rules for cutting and baling of the National Assoc. of Broom Manufacturers, Chicago.——" Manuring of Broom Corn," Bull. Inter. Inst. Agric., Rome, iv. 8th Aug. 1913, pp. 1222–1224.——" Broom Corn from Nyasaland," Bull. Imp. Inst., xiii. 1915, pp. 201–203.——Dwarf Broom Corns, Rothgeb, U.S. Dept. Agric. Farmers' Bull. No. 768, 1916, pp. 1–16, illustrated.——Broom Corn Experiments at Woodward, Oklahoma, Rothgeb & Sieglinger, U.S. Dept. Agric. Bull. No. 836, 1920, pp. 1–53.

Sorghum Caffrorum, *Beauv.*; Fl. Trop. Afr., IX. p. 130.
Ill.—Gay, Grasses, t. 91.
Vernac. name.—Kafir (N. America, *Stapf*, *Piper*).

Bornu in Nigeria (see the varieties below); Damaraland, Rhodesia, and cultivated in South Africa in several races mainly

characterised by the colour of the mature glumes and grains, also in Mauritius and North America (l.c.).

An annual, culms about 6 ft. high (Stapf, l.c.) 5–7 ft. (Montgomery, Corn Crops, p. 309). Grain—usually in erect heads, white, yellowish, reddish, or apricot-orange more or less shaded in these colours. The stems are sweet, but less so than the "sweet sorghums" (*S. saccharatum*). In North America where "Kafir corn" is stated to have been introduced from S. Africa in 1876, the varieties grown are "Blackhull Kafir"—nearly white grains with black glumes, the most important; "Red Kafir"—dark red grains, yellowish to dark gray glumes; "Pink Kafir"—pink grains; "White Kafir"—white grains and glumes (Piper, Forage Pl. p. 272). These—"red," "white" and "black hull" are the three principal varieties of "Kafir"; the red variety is open to objection because of the astringent taste of the seed-coat, common to all Kafirs with a coloured seed-coat; in the white seeded variety, "blackhull," the seed-coat is not astringent, and in America it is said to probably furnish nine-tenths of the Kafir crop, the other tenth being met with Red Kafir (Montgomery, l.c.) in this group, whilst together with "Milo" and "Brown Durra" in the Durra group (*see S. Durra*) they are the principal Sorghums grown there for grain (l.c. p. 315). The varieties of this species may also be grown for forage. There are no specimens at Kew to prove the existence of this plant in Nigeria, but there is a record (U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 137, 1909, "Seeds & Pl. Imported," p. 18) under "Kafir" (*Andropogon Sorghum*) of the varieties "Black Hull," "Red Matakwa" and "White Matakwa" being presented to the Department of Agriculture (U.S.) by the Transvaal Department of Agriculture, the seed coming originally from Maiduguri, in Bornu, Northern Nigeria.

Ref.—Kafir as a Grain Crop, Ball, U.S. Dept. Agric., Farmers' Bull. No. 552, 1913, pp. 1–19, illustrated.——"Kaffir Corn (*Dari*)" from South Africa, Bull. Imp. Inst., xiii. 1915, pp. 379–380.

Sorghum caudatum, *Stapf*; Fl. Trop. Afr., IX. p. 131.

Cape Verde Islands, Uganda, B.E. Africa, Angola, Belgian Congo, Zanzibar, in Africa; introduced to Tropical America, Jamaica, etc.

A food grain of some importance, widely cultivated in Angola, the Sudan, East Africa, etc. It grows to a height of about 14 ft. Several varieties are distinguished in the Flora of Tropical Africa, amongst which may be mentioned var. *angolensis*, Stapf, the commonest *Sorghum* grown in Angola; var. *Cerevisiae*, Stapf, with red grains, used exclusively for fermenting beer in Uganda (Dawe, Herb. Kew) and var. *Feterita*, Stapf, perhaps the most important food-grain in the Sudan, where in the Geteina district it is known as "Maghbash Akhdar" (specimen in Herb. Kew—Imp. Inst.) "Feterita" has a grain remarkable for its whiteness and for this reason it has been recommended for making bread

—an experiment with the flour (25 per cent.) added to wheat flour of good quality was made at the Hygiene Bureau, Florence, the resultant loaf being described as well risen, light, uniform in colour, excellent in flavour, and superior to that of other bread made from wheat, with the addition of rice, rye or potatoes. The average weight of 100 seeds is 2·57 grams, the weight of the bushel is 61·88 lb., and the flour is of excellent quality—fine, soft and smooth, colour white, inclining to pink. The composition is water, 8·45; nitrogenous matter, 12·98; fats, 3·3; nitrogen free extract, 72·45; crude fibre, 1·03; ash, 1·71 per cent. (Bull. Bur. Agric. Inst., Rome, *seq.* p. 983; from "La Dura Come Surrogato del Frumento Nella Pacificazione," Caselli, L'Agric. Col., ix. 1915, pp. 217–227). This variety was grown at Kew in 1914—June to September, and there is in the Herbarium at Kew a specimen with a small head of ripe grains—about 63 grains in all (the heads are very much larger in a suitable climate), and it has been introduced to Arizona and other parts of the Southern United States as a forage crop.

Ref.—"Feterita: A New Variety of *Sorghum*," Vinall & Ball, U.S. Dept. Agric. Bur. Pl. Ind. Circ. No. 122, 1913, pp. 25–32. ——"Durra (*Sorghum vulgare*) as a Substitute for Wheat in Bread-making," Caselli, in L'Agric. Col., ix. April–May 1915, pp. 217–227; extract in Bull. Bur. Agric. Inst., Rome, vi. July 1915, pp. 983–984.

Sorghum cernuum, *Host*; Fl. Trop. Afr. IX. p. 136.

Ill.—Gay, Grasses, t. 92 (*S. cernuum*); Host. Gram. Austr., iv. t. 3.

Vernac. names.—Mazaggua, Masakuwa, Masakwa or Mazgua (Bornu and Bagirmi, *Stapf, Dalziel*); Massakua or Mossoga (Bornu, *Koernicke*); Maskwari (Fulani, N. Nigeria, *Dalziel*); Manio (Gambia, *Stapf, Dudgeon*); A'madiboubon (Segu, *Stapf*); Durra eweige (Egypt, *Stapf*); Durrah (Hadramaut, Arabia, *Lunt*); Bechna ? (Algeria, *Kearney & Means*).—Dry Season Corn.

Bornu, N. Nigeria; Cameroons, Gambia, Senegal, North Africa—Egypt, Algeria, etc., Portugal, Asia Minor, N. India, etc. Introduced to the West Indies, Rhodesia, and other Colonies.

A staple food grain in West Africa: sometimes eaten whole after cooking, Adamawa and Bornu (Dalziel, Hausa Bot. Voc. p. 23) and in all countries where commonly grown. The white Sorghum, "Bechna" of the Arabs, probably belongs here; it is much used by the better class of Kabyles in Algeria as a substitute for wheat flour in making "Couscous" and bread (Kearney & Means, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 80, 1905, p. 76).

The "Maskwari" crop in Yola is planted at the end of the rains and reaped in February to April; planting is done little by little as the water subsides, half an hour's work or so a day —in the slack season. The report of a crop of 5½ acres (August 1913) gave 2917 lb. threshed and 2206 lb. unthreshed, value £2;

the work was done by one man and one girl of 13; the ground took some 20 days in clearing of thorn bushes, and the crop took 3 days to reap, 2 to strip and clean and 2 days to carry (Webster, Nigeria Gaz., April 2nd, 1914). In St. Kitts, West Indies, "Mazzagua" is planted about July or August on 3-feet banks, each seed 1 ft. apart in the row and comes to maturity in five months. It is harvested by cutting off the ears near the top of the stem and then carrying them in baskets to the house or shed; the ears are kept in heaps for a few days, afterwards spread out on the floor of the building and the grains threshed out by means of a flail; threshing may also be done effectively by the machines used for threshing broom corn. Fifty bushels of corn per acre may be considered a good yield; the return from plot experiments at St. Kitts with "Mazzagua" varied between 25 and 35 bushels per acre (Rep. Bot. St. St. Kitts-Nevis, 1913–14, p. 6; Agric. News, Barbados, Nov. 18th, 1916, p. 372). "Mazaggua Guinea Corn," introduced to the Leeward Islands about 1903, is reported to have proved successful there (l.c. Jan. 25th, 1919, p. 30).

An annual, 10–14 ft. high, grain white, well adapted, as its native name in Bornu implies, to growing under comparatively dry conditions.

Ref.—"Nigerian Sorghum in Queensland," in Bull. Imp. Inst., iv. 1906, pp. 226–229, "Mazzagua."

Sorghum Durra, *Stapf*; Fl. Trop. Afr. IX. p. 129.

Vernac. names.—Durra (Egypt, *Forskal*); Durra (United States, *Stapf, Montgomery*); Aklimawi, Safra Kohia, Hamaize (Sudan, *Stapf*); Dura (Eritrea, *Manetti*).—Jerusalem Corn or Egyptian Rice Corn—White Durra; Egyptian Corn—Brown Durra (*Montgomery*).

Sudan, Eritrea, Egypt, Arabia. India, Afghanistan, and the United States.

Grain an important food crop in all the countries where it is known to be grown. "White Durra" and "Brown Durra"—introduced into California in 1874. The former is said to be little grown, as it is frequently injured by insects and diseases; the grain also shatters badly; but the latter has continued in cultivation, especially in Southern California and Texas. A more popular variety of the Durra group is that of "Milo" or "Yellow Milo" introduced about 1885; it is regarded as the best of all the Sorghums for grain production [together with "Blackhull Kafir"]; it comes to maturity in from 90–100 days. The Durras are not considered so well suited for forage as the "Kafir" varieties. The Central and North-East African Durra furnish both forage and grain; those of North Africa are described as low in forage and high in grain production, while those of India produce both forage and grain (Montgomery, Corn Crops, pp. 301, 310). In Eritrea, "Dura" is nearly always grown for food, being little used as fodder (Manetti, L'Agric. Col. Italy, Mar. 1911, p. 100). Experiments with Sudan Durra for brewing

have shown that the grain can be quite successfully employed in the manufacture of roasted grain as a substitute for roasted barley, as flakes, or as sugar of malto-dextrin type, though it is never likely to compete with barley as malt material (Bull. Imp. Inst. 1919, p. 22).

An annual; a variable plant, 14 ft. or more in height; grain white, yellow or reddish.

Ref.—Milo as a Dry-land Grain, Ball, U.S. Dept. Agric., Farmers' Bull. No. 322, 1908, pp. 1–23, illust.——Ricerche Amalitiche sulle Cariossidi dei Cereali Eritrei (" Eritrea Food Grains "), Manetti, in L'Agric. Col. Italy, v. March 1911, pp. 100–113.——" Utilisation of Sudan Dura Grain in Europe," Bull. Imp. Inst., ix. 1911, pp. 253–259.——The Importance o Thick Seeding in the Production of Milo in the San Antonio Region, Hastings, U.S. Dept. Agric. Bull. No. 188, 1915, pp. 1–21. ——" Trials of Sudan Dura for Brewing," Bull. Imp. Inst. xvii. 1919, pp. 22–31.

Sorghum guineense, *Stapf*; Fl. Trop. Afr. IX. p. 123.

There are three varieties, separated provisionally by Dr. Stapf (l.c.); var. *tremulans*—grain white or reddish; var. *involutum*—grain white, and var. *robustum*—grain reddish; including many cultural races.

Vernac. names.—Dawa (Jeba, Hausa, *Barter*); Bakin rakumi, Karama (Sokoto, *Dalziel*); Kiti, Gete or Kokboio (Sierra Leone. *Thomas*); Karandeffi or Karan dafi (N. Nigeria, *Dudgeon, Dalziel*); Faraoro (Middle Niger, *Dumas*).

Upper Guinea—Senegal to Nigeria.

The grain of all varieties and races under the above names is used for food, excepting " Karandeffi " or Faraoro (regarded by Stapf, l.c. p. 125, as the same), a form with reddish grain. grown for medicine and for use in the preparation of a red dye from the stems (Dudgeon, specimen in Herb. Kew, 1909; Agric & For. Prod. W. Africa, pp. 138, 146) or from the red leaf-sheaths (Dalziel, Hausa Bot. Voc. p. 57); used for dyeing leather in Kano. The grain is said to give colic to animals, and the plant is grown exclusively for dyeing leather in the Middle Niger region (Dumas, Agric. prat. pays chauds, v. 1, 1905, p. 461). To obtain the dye the dried stems are pounded up and placed in a calabash, a solution of potash being added; a deep crimson liquid results in which the skin is steeped until a sufficiency has been absorbed to render it permanently deep red in colour (Dudgeon, l.c. p. 138). This product is stated to be " identical with a dyestuff known as 'Sikhtyan' used both for dyeing leather and for staining " lanzura grass' "—used for plaiting into grass mats in the Sudan, where it appears to be used without the addition of " potash " or wood ashes.

A sample of " Sikhtyan " from the Sudan was examined for the Imperial Institute by Mr. A. G. Perkin (Leeds University), who states that " it is a substantive red dye-stuff of the same type as 'Camwood' (*Baphia nitida*), 'Red Sandalwood'

(*Pterocarpus santalinus*) and 'Barwood' (*Pterocarpus Soyauxii*), all of which are supposed to contain the same red dye called 'Santalin' or 'Santalic acid' (Bull. Imp. Inst. vi. 1908—"Materials used in the Preparation of West African Leather," p. 180).

An annual plant, with strong, tall stems.

Sorghum halepense, *Pers.* Syn. Pl. i (1805–07) p. 101.

[*Andropogon halepensis*, Brot. Fl. Lusit. i. p. 89; Hooker, Fl. Br. India, vii. p. 182.] A perennial grass, 3–15 ft. high, with creeping stoloniferous roots. Leaves 8-18 in. long, or more, up to 3 in. broad, narrowed to the rounded base, flat or waved. Panicle, 6 in.–2 ft., very variable in form and amount of ramification, typically pyramidal with long sub-erect or spreading or drooping whorled branches, axils often bearded. Spikes of 1–3, rarely 5–7, pairs of spikelets (Hooker, l.c.).

Vernac. names.—Barù, Braham, Bikhonda etc. (India, *Watt*). Johnson Grass, Aleppo Grass, Evergreen Millet, Means Grass (S. Carolina), False Guinea Grass, Cuba Grass, Morocco Millet, Syrian Grass, etc. (*see*, U.S.Dept. Agric. Bur. Pl. Ind. Bull. No. 11, 1902, *seq.*)

Native of Western Asia; found in India, Burma, Ceylon and the Mediterranean region; naturalized in the hotter parts of the United States

Seeds eaten by tne poorer classes in India, where the grass is also considered a good fodder both for grazing and for hay (Dict. Econ. Prod. India) and similarly in the United States, where in the south it is said to probably produce more hay than any other perennial grass, excepting perhaps "Bermuda Grass" (*Cynodon Dactylon*). The rootstocks are also readily eaten by farm animals, especially hogs, and in Texas, fields are sometimes ploughed up in winter for feed (Piper, Forage Pl. p. 244).

The plant spreads so freely when once established that it may soon become more or less of a pest under circumstances in which there is no use for it; wherever cotton succeeds it will thrive, and it is well adapted to growing with "cow peas" (*Vigna Catiang*), producing on rich black soils, sometimes three cuttings averaging 1½–2 tons at each cutting (l.c.).

In common with other species of the genus it may require some care when fed green, it is regarded as injurious to animals if eaten too young or stunted by drought (Watt, l.c.), and cases of poisoning cattle have occurred in Montana and California; but there are no cases of poisoning reported from the Southern United States, where the grass is most abundant (Piper, l.c.).

There is no record of this grass in Nigeria; and it may be open to question whether, if not already arrived there from North Africa—where Trabut states (Le Progres Agric., xxiii. March 5th, 1916, p. 235; Bull. Bur. Agric. Inst. Rome, May 1916, p. 682) "Aleppo Sorghum has spreading rhizomes which forms a coarse dry grass much disliked by cultivators"—and the Mediterranean region, it is advisable to admit it; but it is

considered worthy of mention by the side of its annual counter-part *Sorghum sudanense*, with which plant it has at times been confused.

Ref.—Johnson Grass: Report of Investigations made during the season of 1901, Ball, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 11, 1902, pp. 1–24.——The Poisonous Action of Johnson Grass, Crawford, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 90, part 4, 1906, pp. 1–6. "Poisoning by *Sorghum halepense*," Kew Bull. 1914, pp. 229, 230.—"*Sorghum halepense*," l.c. 1919, p. 24.——"Johnson Grass (*Andropogon halepensis*)," in Forage Plants, Piper, pp. 244–247 (The Macmillan Co., New York, 1915) and see references under *S. sudanense*.

Sorghum lanceolatum, *Stapf*; Fl. Trop. Afr. IX. p. 112.

Vernac. names.—Dawar rafi, Dawar kada, Dawar dorina (Katagum, Hausa, *Dalziel*); one of several called Elephant Grass (*Dalziel*, Hausa Bot. Voc., p. 24).

Katagum in Nigeria, White Nile, Sudan.

Annual; slender, pithy stems, 10 ft. or so high, by rivers, Katagum (Dalziel, Herb. Kew). No uses found recorded, but mentioned here because it appears to have been confused with *S. halepense*.

Sorghum margaritiferum, *Stapf*; Fl. Trop. Afr. IX. p. 125.

Vernac. names.—Kendé bilé, Kendé rouge, Kendé blanc (Middle Niger, *Dumas*).

French Congo and probably Middle Niger (Stapf. l.c.).

Grains small, red or white, valued for food.

An annual plant, cultivated along the Middle Niger (Dumas, Agric. prat. pays chauds, v. 1905, pp. 459, 460).

Sorghum melaleucum, *Stapf*; Fl. Trop. Afr. IX. p. 134.

Vernac. name.—Shelsheleih (Sudan, *Stapf*).

Sudan (specimen in Mus. Kew from Rubber Exhibition, London, 1914).

Grain white, about the size of that of *S. Durra* or *S. guineense*.

Sorghum Roxburghii, *Stapf*; Fl. Trop. Afr. IX. p. 126.

Ill.—Medley Wood, Natal Pl. ii. t. 120 (var. *semiclausum*, Stapf); Ball, U.S. Dept. Agric. Bureau Pl. Ind. Circ. 50, 1910, p. 5 (seed-heads).

Vernac. names.—Shallu (India, *Stapf*); Shallu (North America, *Stapf, Ball, Montgomery, Piper*); Mtama-Niope (Zanzibar, *Stapf*); Egyptian Wheat, California Wheat, Mexican Wheat (United States, *Rothgeb, Montgomery*); California Golden Sorghum, Egyptian Rice, Rice Corn (United States, *Rothgeb*).

Native of India, also in Natal, British E. Africa, Nyasaland, and introduced to N. America.

Grown for the grain and to some extent as a forage plant; cultivated as a winter crop—sown in October and harvested in March in India (Watt, Comm. Prod. India, pp. 1033, 1036; Montgomery, Corn Crops, p. 313), where there are several cultural races known, two of which—var. *semiclausum* and var.

hians are also found in Africa (Stapf, l.c.). Shallu requires a long—from 125–140 days—favourable season to mature, and for this reason is not considered so dependable a grain crop as "Milo," "Feterita," or early varieties of "Kafir" under dry-land conditions, without irrigation; the plant suckers freely, grows to a height of from 5–8 ft., with large open heads and comparatively dry stems (Rothgeb, U.S. Dept. Agric. Farmers' Bull, *seq.*).

Ref.—"Shallu, or Egyptian Wheat," Rothgeb, U.S. Dept. Agric. Farmers' Bull. No. 827, 1917, pp. 1–8; illustrated.

Sorghum saccharatum, *Auct. vix Linnaeus.*

Annual; upwards of 10 ft. in height, stout; pith juicy and sweet; otherwise characters in general much the same as the *Sorghums* grown for grain. Seed reddish brown.

Ill.—Collier & Le Duc, Sorghum Sugar, t. 1 ("Early Amber"), t. 2 ("Chinese Sorgo" or "Sumac"), t. 3 ("White Liberian" or "Gooseneck" or "White Imphee"), t. 4 ("Honduras" or "Honey Cane"); Piper, Forage Pl. p. 266, t. 2 ("Gooseneck Sorgo"—a field in Texas).

Vernac. names.—Takanda (Kontagora, *Dalziel*); Durra negro (Egypt, *Dudgeon*); Hiassa—Kala (Middle Niger, *Dumas*).—Sorgho, Sugar Sorgo, Chinese Sorgo (*Montgomery*), Sweet Sorghum, Sorghum.

Cultivated in China, India, United States. The Sugar Sorghum cultivated in Kontagora (Dalziel, Hausa Bot. Voc., p. 91; Bull. Imp. Inst., 1907, p. 260), in Egypt (Dudgeon, Egyptian Agric. Prod., Cairo, No. 1A, 1915, p. 29), and the Middle Niger (Dumas, Agric. prat. pays chauds, v. 1, 1905, p. 459; Stapf, Fl. Trop. Afr., l.c. p. 153), probably also belong here.

A forage crop of importance in the United States, where also it is utilised for the extraction of sugar and syrup. Experiments were being made in the States about 1880, and of the varieties grown at that time there are three—"Early Orange," "Early Amber," and "Honey Cane"—in the collection presented by the United States Department of Agriculture to the Museum at Kew in 1882, that are recommended, together with "Sumac," "Gooseneck," and "Planter," for cultivation at the present time (Ball, Montgomery, Conner, Piper, *seq.*). "Gooseneck" Sorgo is known as "Texas Seeded Ribbon Cane" (Ball, U.S. Dept. Agric. Bur. Pl. Industry, Circ. No. 50, 1910). The total amount of Sorghum syrup produced in the United States in 1909 was 16,532,282 gallons—chiefly from the States of Kentucky, Tennessee, Missouri, Arkansas and North Carolina (Hitchcock, Text-book Grasses, p. 73).

The Northern Nigeria plant (Dalziel, l.c.) is said to resemble "Guinea Corn" [Sorghum grown for grain] in general habit, to grow on any kind of soil and to be reaped before "Guinea Corn" is planted. The Egyptian plant (Dudgeon, l.c.) is reported to be only planted as a fodder crop, though it is not largely cultivated in any part of the country. The first cutting—yield about

7–9 tons—is obtained about 10 weeks after sowing, and a second is taken about 4–5 weeks later. The plant grows in soil containing salt, and it is here grown only on land of this character, where other fodder crops would not give a good return on account of the salt. The ground is prepared in the same way as for grain sorghum, being first ploughed and the seed then either sown broadcast or ploughed in alternate furrows in the second ploughing; seed used is from 1½–2 kêlas per feddân (approx. 35–50 lb. per acre) (Foaden & Fletcher, Egyptian Agric. ii. 1910, p. 446). The Middle Niger plant (Dumas, l.c.—" Hiassa-Kala," " Sorgo à Sucre," *Sorghum saccharatum*, p. 461) commonly cultivated in this region and in Hausaland (Chevalier, Bull. Soc. d'Accl. France, 1912, p. 386—*Andropogon Sorghum* var. *saccharatum*, Pers.) is grown for its sweet stems, said to contain upwards of 12 per cent. of sugar. For sugar or syrup the canes are recommended to to be cut when the seed is comparatively hard; the percentage of sucrose at this period having been found to be at its best (11·69) and an average yield of green sorghum is from 8–10 tons; the percentage of sugar in the juice varies from 8–15, and one ton of canes is estimated to give 700–1200 lb. of juice, yielding 10–30 gallons of syrup, according to quality; extraction is effected with heavy roller presses; then clarified and evaporated (Montgomery *seq.* pp. 328–330). Experiments at Pusa show that as a source of sugar, " saccharine jowar " is not worth growing in India—a demand for the syrup would have to be created, the high glucose ratio of the juice militates against the production of good crystalline gur, and the juice contains also substances which produce at times a very objectionable taste in the gur; apart from this the yield per acre worked out at or about 8 cwt. or only about ⅓ of that from the average country sugar-cane crop. In experiments at Poona with the exotic Sorghum varieties—" Collier " and " Amber," very similar yields were obtained, *viz.*, 1174 lb. and 1072 lb. of molasses per acre respectively. As a source of fodder the plant seems valuable, the crop is fairly quick-growing and a plot at Lyallpur yielded 13 tons of total green produce per acre and it is recommended to cut before the seed passes the thin milk stage, as beyond this the nutritive value of the crop as fodder decreases (Annett, Agric. Res. Inst. Pusa, Bull. No. 41, 1914, p. 8).

The cultivation in general will be the same as for the grain sorghums as above described and see also end of the genus.

Ref.—" On the Composition of *Sorghum saccharatum* (*Holcus saccharatus*) or North China Sugar Cane," Voelcker, in Journ. Roy. Agric. Soc. England, xx. 1859, pp. 378–384.——Sorghum Sugar, Collier & Le Duc, U.S. Dept. Agric. (Letter of the Commissioner of Agric.), pp. 1–42; pls. i.–xxxiii. (Govt. Printing Office, Washington, 1880).——Report on the Extraction of Sugar from Sorghum and Maize, Drummond, Diplomatic & Cons Rep. Misc. No. 2, 1886, United States, pp. 1–22.——Report on the Manufacture of Sugar from Sorghum in Kansas, Diplomatic

& Cons Rep. Misc. No. 83, 1888, pp. 1–6.——"Sorghum Sugar: The Sugar Sorghum or Broom Corn" (*Andropogon Sorghum*, Brot. var. *saccharatus*, Koern., Kew Bull. 1897, pp. 173–174.——"Sorghum Sirup Manufacture," Denton, U. States Dept. Agric., Farmers' Bull. No. 135, 1901, pp. 1–39, illustrated.——Saccharine Sorghums for Forage, Ball, U.S. Dept. Agric. Farmers' Bull. No. 246, 1906, pp. 1–37, illustrated.——The best two Sweet Sorghums for Forage, Conner, U.S. Dept. Agric. Farmers' Bull. No. 458, 1911, pp. 1–23, illustrated.——Sorghum Sirup Manufacture, Bryan, U.S. Dept. Agric. Farmers' Bull. No. 477, 1912, pp. 1–40, illustrated.——"The Saccharine Sorghums: Sweet Sorghums," pp. 293–300 and "Sorghum for Sirup Making," pp. 328–330 in The Corn Crops, Montgomery (The Macmillan Co. New York, 1913).——The Use of Sweet Jowar (*Sorghum* sp.) as a source of Commerical Sugar or as Fodder and the Variation in Composition of the Crop during growth, Annett, Agric. Research Inst. Pusa, India, Bull. No. 41, 1914, pp. 1–9.——"The Importance of Sweet Sorghum," Piédalla, in Comptes Rendus des Séances de l'Acad. d'Agric. iii. Dec. 5th, 1917, pp. 1091–1095.

Sorghum sudanense, *Stapf;* Fl. Trop. Afr. IX. p. 113. [*Andropogon Sorghum*, var. *sudanensis*, Piper in Proc. Biol. Soc. Wash. xxviii. p. 33.]; **Sorghum virgatum,** *Stapf*, l.c. p. 111 [*Andropogon Sorghum exiguus*, Piper, l.c. p. 32; *S. exiguum*, Trab. *seq.*].

Ill.—Piper, Forage Pl. p. 280, t. 3, p. 282, t. 4 (a field).

Vernac. names.—Garawi (Egypt, *Piper*).—Sudan Grass (*sudanense*), Tunis Grass (*virgatum*).

Sudan, Upper Egypt—no specimens at Kew from Nigeria. The details below refer primarily to *sudanense* and in the main also apply to *virgatum*.

A fodder plant of growing importance in the United States—introduced in 1909 (Piper, *seq.*) and cultivated in Egypt for the same purpose. It is suitable for hay, pasture and as a soiling crop, better adapted for dry regions than "Johnson Grass" (*Sorghum halepense*) and being an annual not so likely to become troublesome in the same way; it comes to maturity in about 3 months. The stems are slender, 6–10 ft. high and apart from the perennial character it has much the appearance of Johnson Grass, from the seed of which it is difficult to distinguish. It is recommended for growing in mixtures with "Cowpeas" (*Vigna Catiang*) and "Soy bean" (*Glycine Soja*) in the United States (l.c.); in North Africa (Trabut, Le Progrés Agric. Paris, March 5th, 1916, p. 235) and might be given a trial in Nigeria.

Seed may be sown broadcast or in rows about 3 ft. apart, at the rate of from 4–8 lb. per acre. An average crop is estimated at from 3–5 tons of hay per acre; but in some trials with this plant as a fodder crop, a yield of 1626 lb. per acre is recorded (Walters, Rhodesia Agric. Journ. Oct. 1920, p. 433). Analysis shows the hay to have a higher feeding value than that of

'Timothy" (*Phleum pratense*) (Bull. Bur. Agric. Inst. Rome, 1916, p. 68).

Ref.—Sudan Grass : A New Drought-resistant Hay Plant, Piper, U.S. Dept. Agric., Bur. Pl. Industry, Circ. No. 125, 1913, pp. 1–20.——" Sudan Grass (*Andropogon Sorghum*, var.)" in Forage Plants and their Culture, Piper, pp. 279–284 (The Macmillan Co. New York, 1915).——" Sorghum (*S. exiguum* f. *maxima*) in North Africa," Trabut, in Le Progrés Agric. Paris, xxiii. March 5th 1916, pp. 235–237 : Abstract in Bull. Bur. Agric. Inst. Rome, vii. May 1916, p. 682.——Distinguishing Characters of the Seeds of Sudan Grass and Johnson Grass, Hillman, U.S. Dept. Agric. Bull. No. 406, 1916, pp. 1–5, illustrated.——" Value of Sudan Grass (*Andropogon Sorghum*) as a Forage Crop," Stemmons, in the Country Gentleman, Philadelphia, lxxx. Nov. 13th, 1915, p. 1712 : Reprint in Bull. Bur. Agric. Inst. Rome, vii. Jan. 1916, pp. 68–69.——Johnson and Sudan Grasses in Barbados," Agric. News, Barbados, xvii. June 1st, 1918, p. 168.——" L'Herbe du Soudan ou Soudan Grass," C.C. in L'Agronomie Coloniale (formerly L'Agric. prat. pays chauds) Mai–Juin, 1919, pp. 196–197 (Compt. Rendu de L'Acad. d'Agric. 1919, p. 460).

Sorghum Vogelianum, *Stapf ;* Fl. Trop. Afr. IX. p. 116. [*Andropogon Sorghum*, var. *Vogelianus*, Piper in Proc. Biol. Soc. Wash. xxviii. p. 34.]

Nun (Niger) River (Vogel), Engenni River (Holland), Benue River (Macleod) and Oban (Talbot) in Nigeria ; Cameroon River (Mann).

A tall annual grass, 6–15 ft. high.

All of the above species of *Sorghum* that yield a serviceable grain may be called " Great Millet " or " Guinea Corn," as these names were always associated with *Andropogon Sorghum*, Brot. var. *vulgaris*, Hack. (*Sorghum vulgare*, Pers.), the very diverse characters of which have been separated into the several species above noted (Stapf, Fl. Trop. Africa, l.c.) including the distinct cultural groups recognised in the United States (Ball, Piper, *seq.*) and India (Watt, *seq.*) ; but it is important to note as Dr. Stapf points out (l.c. p. 135) that " an exhaustive treatment of the hundreds of races which have been given distinctive popular names," is not yet possible. Broadly the cultivated Sorghums are sometimes divided into juicy, sweet-stemmed and dry-stemmed ; or " Saccharine," " Non-Saccharine " and " Broom " Sorghums, they are grown chiefly for the grain (*bicolor*, *caffrorum*, *caudatum*, *cernuum*, *guineense*, *Roxburghii*), sugar and syrup (*saccharatum*), forage (*halepense*, *sudanense*, and most others, especially those with sweet stems) and for brooms (*technicus*).

The grain in this country in its use for feeding poultry is better known as " Dari " or " Derry Corn " ; the quotations on the Corn Market are for " Indian Dari," " Persian Dari," etc. according to country of origin, usually at per quarter of 480 lb.—price (1911) 24*s.* (Journ. Bd. Agric. May 1911, p. 179) ; imported

chiefly from the United States, British India, Egypt, Persia, Japan, Java, South Africa, East Africa, etc.

A sample of "Guinea Corn" from Nigeria was valued in England (Oct. 1909) at 23*s.* per 480 lb., delivered *ex* Quay. The grain varied in colour from white, through yellow to black, with occasional red grains; the brokers to whom the sample was submitted reported that it was of fairly good quality, though containing an admixture of yellow grains which would be prejudicial to its sale. At that time the market for Guinea corn in the United Kingdom was stated to be increasing (Col. Rep. Ann. No. 687, 1911, p. 33; N. Nig. Gaz. April 30th, 1910, p. 93).

"Kaura" has a large yellow grain, with biscuit coloured glumes (Rae, Ann. Rep. Dept. Agric. N. Nigeria, 1914, p. 12), common in Zanfara and considered the best for horses (Dalziel, Hausa, Bot. Voc. p. 23); "Fara-fara" has a smaller white grain, with black glumes, much preferred by the natives for storing purposes (Rae, l.c.). "Jigari" (Yola), "Jan-jari" or "Janari" (Sokoto) is an inferior red grain, used by the Pagans, chiefly for the preparation of an intoxicating drink called "Peto" and as a rule only resorted to for food in the case of failure in the crop of proper Guinea Corn, Yola (Dalziel, Kew Bull. 1910, p. 140 and l.c.). "Jar dawa," with a red grain and "Akwuya," with a yellow grain, are used for feeding horses (l.c.), and in general Guinea Corn is one of the two principal food crops of the Hausas in Nigeria (Lamb, "Agric. in Hausaland," Bull. Imp. Inst. 1913, p. 626—*Sorghum vulgare* and *Pennisetum typhoideum*).

The best kind of Chinese whisky or so-called wine or "Samshu" is distilled from the seeds of Sorghum ("Kaoliang" *seq.*); in the provinces of Yunnan and Szechuen 90 per cent. of the seed is used for this purpose, being only occasionally employed for food and in the province of Hupeh, Yangtze Valley the sole use of "Kaoliang"—a brown seeded form is for making wine and spirits (Wilson, Gardeners' Chronicle, Sept. 1905, p. 246). Samples of the spirit—"Kaoliang whisky" distilled from the grain in Manchuria were exhibited at the Japan-British Exhibition, London, 1910 (Kew Bull. 1912, p. 122) of which there is an original bottle of the spirit in the Museum at Kew.

Many other uses are attributed to the various forms in all parts of the world where the plant is grown. Hedges in the villages north of Kano are often entirely made of the stalks of Guinea Corn (Dudgeon, Agric. & For. Prod. W. Africa, 1911, p. 120). The "Kaoliangs" ("Great Millet," "Giant Millet" or "Tall Millet") of China, Manchuria and Japan are used for a similar purpose (Ball, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 253, 1913, p. 63); built around houses, yards, pig-pens etc. (l.c. p. 18) as a protection in winter against the icy winds from the north, and in addition the stalks are made to serve a variety

of purposes, including supports for beans, cucumbers, yams, for thatching, in the building of light bridges and houses, making of baskets, mats (l.c. p. 63) for fuel etc.; the blades [leaves], two or three weeks before the plant matures are stripped off, tied in bundles, cured in the sun for a few days and stacked indoors for winter fodder, being relished by horses and donkeys (l.c. p. 20). Great Millet ("Jowar") is commonly cultivated in India (*see* extent below); it is the most widely grown fodder plant in the Bombay Presidency, where it is said to meet all requirements (Burns, Agric. Journ. India, x. 1915, p. 288).

The particulars as to uses might be given to cover many other countries; but the above together with those under the species enumerated may be sufficient to indicate how indispensable *Sorghum* is in countries too dry for maize or rice, for instance and in the present search for motor fuel the cultivation of this grain as a source of spirit as well as for food is capable of considerable extension.

It is difficult if not almost impossible to estimate the full extent of the Sorghum crop in various parts of the world; but that of India and Burma is put at (in 1908 approx.) 24,000,000 acres, which at a low average of 6 maunds (500 lb.) per acre, would be an annual production of 5,000,000 tons of grain (Watt, Comm. Prod. India, p. 1033) that of the United States at 3,000,000 acres (Montgomery *seq.* p. 281) and that of Africa is from lack of detailed figures impossible to calculate, but it might easily equal the returns for any one of the countries mentioned, already quoted.

The cultivation is approximately the same for all annual varieties and similar to that of "Maize" or "Corn" (*Zea Mays*). The climatic conditions in general may be regarded as much the same as those required for "Cotton" (*Gossypium* spp.); the seed may be sown broadcast or in rows about 3 ft. or so apart in ground previously well prepared. In N. China the seeds are soaked in water overnight and sown in rows in hills 2–3 ft. apart, the plants on each hill thinned out to one, when about a foot or so high (Meyer, in Ball, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 253, 1913, p. 11); it is estimated here that 8 lb. of seed will sow an acre of ground and that the yield in grain will be half a ton if the crop is good, with $1\frac{1}{4}$–$1\frac{1}{2}$ tons of 2000 lb. of stalks per acre (Sammons in Ball, l.c.).

The yield of grain per acre of Guinea Corn ("Kaura," sown June 4th) and Millet ("Gero"—*Pennisetum typhoideum* sown May 27th) interplanted was 736 lb. of "Kaura" and 560 lb. of "Gero," on a plot of 6 acres; and of "Guinea Corn" ("Fara-fara," sown June 6th) with Millet ("Maiwa"—sown June 6th) and Millet ("Gero"—sown May 27th) interplanted, the yield per acre of each was 520 lb. of "Fara-fara," 753 lb. of "Maiwa" and 560 lb. of "Gero" on a plot of 4 acres, at Ilorin; the expenses for each plot were £1 19*s.* 7*d.* per acre (Ann. Rep. Dept. Agric. N. Nigeria, 1914, App. iii. Table C, p. 20).

In the United States the grain Sorghums are usually planted soon after corn [Maize], in rows 3–3½ ft. apart, the plants 6–8 in. apart for the Milos and Durras [*Sorghum Durra*] and 8–10 in. for the Kafirs [*S. caffrorum*], the amount of seed required, 3–5 lb. per acre (Montgomery, The Corn Crops, p. 317); Sorghum for forage is sown thick in drills about 3 ft. apart and cultivated or sown close, broadcast or with the grain drill, at the rate of about 15 lb. of seed per acre in rows or 1–2 bushels per acre, broadcast (l.c. p. 321). 25–30 bushels of seed and 3–6 tons of cured fodder per acre is an average yield (l.c. p. 323).

Some uncertainty attaches to the genus as a fodder and cases of poisoning have been recorded when pastured or used in a green state. There seems to be considerable difference of opinion as to the exact stage at which there is danger of poisoning but it is generally allowed that the green plant is not safe for feeding until it is at or near the flowering period and that the poisonous effects of young green Sorghum is due to the formation of prussic acid and various hypotheses have been put forward—based on climatic conditions, variety, nitrogen content in the soil, insect attack, etc.—for a discussion of which it may be advisable to see the following papers [" *Sorghum halepense* " in Dict. Econ. Prod. India, Watt, vi. part 3, 1893, p. 281; " Poisoning of Cattle by the Juar Plant; through the large deposits of Nitrate of Potash that under certain conditions are thrown down in the Stems," Pease, Agric. Ledger, No. 24, 1896, pp. 1–5; " Cyanogenesis in Plants," Part 2 " Great Millet (*Sorghum vulgare*)," Dunstan & Henry in Trans. Roy. Soc. cxc. 1902, p. 399, and Proc. Roy. Soc. lxx. 1902, pp. 153–154; " Sorghum Poisoning," Burtt-Davy, in Transvaal Agric. Journ. iii. Jan. 1905, pp. 308–309; " Notice sur l'effet Protecteur Assigne a l'acide Cyanhydrique des Plantes," Treub, in Annales du Jardin du Buitenzorg, xxi. 1907, p. 107; " Sorghum—Poisonous Property," Watt in Comm. Prod. India, pp. 1040–1041; " Sorghum Poisoning," Cameron, in Journ. Agric. Victoria, vi. 1908, pp. 161–162; " Green Sorghum Poisoning," in West Indian Bull. iii. 1902, pp. 326–333; " The Poisonous Properties of Immature Sorghum," in Bull. Imp. Inst. viii. 1910, pp. 384–388; " Sorghum Poisoning," in Agric. Gaz. N.S. Wales, xxii. Nov. 1911, pp. 967–968—Reprint in Agric. News, Barbados, xi. Jan. 20th 1912, p. 21; " Prussic Acid Content of Sorghum " in Agric. News, Barbados, xiv. June 19th, 1915, p. 201, from Journal of Agricultural Research, May 1915; " Cattle Poisoning by Juar (*Andropogon Sorghum*) and its Prevention," Taylor & Ghosh, in Agric. Journ. India, xi. Oct. 1916, pp. 377–383].

Ref.—Report on Analytical and Other Work done on Sorghum and Corn Stalks by the Chemical Division, Collier, U.S. Dept. Agric. Special Report No. 33, 1881, pp. 1–101, with Synoptical Table and 13 plates of varieties " Liberian " (syn. " Imphee," ' Sumac," or " Chinese Cane "), " Neezeana," " Wolf Tail," " Gray Top," " White Mammoth," " Rice or Egyptian Corn,"

"Oomseana," "Black Top," "Hybrid" (by E. Link), "Honduras" (Syn. "Mastodon," "Sprangle Top," "Honey Cane"), "Early Amber," "Goose Neck," and "White Liberian."——Record of Experiments with Sorghum in 1892, Wiley (and several collaborators), U.S. Dept. Agric. Div. Chemistry, Bull. No. 37, 1893, pp. 1–100.——"The Great Millet (*Sorghum vulgare*)" in Dict. Econ. Prod. India, Watt, vi. 1893, pp. 289–317.——Sorghum as a Forage Crop, Williams, U.S. Dept. Agric. Farmers' Bull. No. 50, 1899, pp. 1–19.——"*Sorghum vulgare*, Pers (*Andropogon Sorghum*, Brot.): The Great Millet or Juar in India," Watt, Agric. Ledger, No. 6, 1905, pp. 83–115.——The Great Millet or Sorghum in Madras, Dept. Agric. Madras, Bull. No. 55, 1906, pp. 53–122.——The Non Saccharine Sorghums, Warburton, U.S. Dept. Agric. Farmers' Bull. No. 288, 1907, pp. 1–28.——"Sorghum," Ball, in Cycl. American Agric. Bailey, ii. pp. 574–582, ff. 808–814—classification into "Broom-corns," "Shallu," "Sweet" or "Saccharine" Sorghums, etc. (Macmillan & Co., Ltd. London, 1907).——"The Great Millet (*Sorghum vulgare*)" in The Commercial Products of India, Watt, pp. 1031–1043 (John Murray, London, 1908).——"Analyses of Great Millet (Dura)" in "Chemical Composition of some Sudan Grains," Beam, Wellcome Research Lab. Khartoum, 3rd Rep. 1908, pp. 402–404; analyses of 27 varieties.——"Guinea Corn" in "Some African Food Grains," Bull. Imp. Inst. vii. 1909, p. 148—Samples from Ilorin.——The History and Distribution of Sorghum, Ball, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 175, 1910, pp. 1–63, illustr.——"*Andropogon Sorghum*, Millet or Pyanng: Its Cultivation and Some of Its Enemies," Aubert, in Agric. Journ. India v. part 2, April 1910, pp. 222–230; pls. xvi.–xxi.——Three Much Misrepresented Sorghums, Ball, U.S. Dept. Agric. Bur. Pl. Ind. Circ. No. 50, 1910, pp. 1–14; "Shallu," "Chocolate Corn" and "Gooseneck Sorgo" ("Texas Seeded Ribbon Cane").——The Smuts of Sorghum, Freeman & Umberger, U.S. Dept. Agric. Bur. Pl. Industry, Circ. No. 8, 1910, pp. 1–8.——Better Sorghum Grain Crops, Ball, U.S. Dept. Agric. Farmers' Bull. No. 448, 1911, pp. 1–36, illust.——The Importance and Improvement of the Grain Sorghums, *Ibid.* l.c. Bur. Pl. Industry, Bull. No. 203, 1911, pp. 1–45, illustr.——Grain Sorghum Production in the San Antonia Region of Texas, Ball & Hastings, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 237, 1912, pp. 1–30, illustr.——The Corn Crops: A Discussion of [Maize], Kafirs and Sorghums, Montgomery, pp. 1–347, illust. (The Macmillan Co. New York, 1913).——"Dry Farming," Henderson, in Agric. Journ. India, viii. 1913, pp. 41–46, with special reference to Sorghum in semi-arid regions without irrigation.——"The Utilisation of Sudan Dura," Bull. Imp. Inst. xi. 1913, pp. 33–45.——Dura for Bread-making," l.c. xiii. 1915, p. 472.——*Sorghum vulgare*: The Great Millet (Durra Baladi or Durra Rafia in Egypt); also *Sorghum halepense* (Garawao), Dudgeon, Egyptian Agric. Products, No. 1A, 1915,

pp. 1–32.——Uses of Sorghum Grain, Ball, U.S. Dept. Agric. Farmers' Bull. No. 686, 1915, pp. 1–15.——" Sorghum " in Bull. Imp. Inst. xiii. 1915, pp. 482–483.——Corn, Milo and Kafir in the Southern Great Plains Area; Relation of Cultural Methods to Production, Chilcott, Griggs, & Burmeister, U.S. Dept. Agric. Bull. No. 242, 1915, pp. 1–20.——" Sorghums " in Forage Plants and Their Culture, Piper, pp. 260–284 (The Macmillan Co. New York, 1915).——New Sorghum Varieties for the Central and Southern Great Plains, Vinall & Edwards, U.S. Dept. Agric. Bull. No. 383, 1916, pp. 1–15.——Sorghum for Fodder, Ministry of Agriculture (London), Special Leaflet No. 53, 1916, pp. 1–2.——Breeding Millet and Sorgho for Drought Adaptation, Dillman, U.S. Dept. Agric. Bull. No. 291, 1916, pp. 1–19.——Grain—Sorghum experiments in the Panhandle of Texas, Ball & Rothgeb, U.S. Dept. Agric. Bull. No. 698, 1918, pp. 1–89.——" Sorghum," in Kew Bull. 1919, pp. 23–26.——" Cholam (*Andropogon Sorghum*) as a Substitute for Barley in Malting Operations," Viswanath, Row and Agyangar, in Memoirs, Dept. Agric. India (Chem. Series) v. Jan. 1919, pp. 117–129.——" *Andropogon Sorghum* (Millets for Fodder on Sugar Estates)," Barber, in The International Sugar Journal, xxii. Nov. 1920, pp. 614–616.

VETIVERIA, Thouars.

Vetiveria nigritana, *Stapf*; Fl. Trop. Afr. IX. p. 157.

Vernac. names.—Jama or Jema (Katagum, *Dalziel*).

Katagum (Dalziel, No. 273, 1908, Herb. Kew), Nupe (Barter, No. 1387, Herb. Kew), Yola (Macleod, Herb. Kew) in N. Nigeria, Oyan River (Holland No. 9, 1900, Herb. Kew) in S. Nigeria and known also from Sierra Leone, Senegal, Senegambia, Gold Coast, Dahomey, Cameroons, Lower Guinea, Zanzibar, Portuguese East Africa and Rhodesia.

Used for thatch, Katagum (Dalziel, l.c.) for " Zana " (fencing) and for plaiting straw armlets called " darambuwa," N. Nigeria (Hausa Bot. Voc. p. 50—*V. zizanioides*).

A perennial 8 ft. on open plains, Nupe (Barter, l.c.), 6 ft. high, in clumps, Katagum (Dalziel, l.c.) culms 10 ft. high, erect, in large clumps, on waste places, once occupied by native dwellings, Angola (Gossweiler, Herb. Kew) and described as a grass with a very blue appearance, common on the edges of pools, Chibabava, Lower Buzi, Gazaland (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 224).

In general closely resembling the following species; but roots not aromatic.

Vetiveria zizanioides, *Stapf*; Fl. Trop. Afr. IX. p. 157. [*Andropogon muricatus*, Retz, Obs. iii. p. 43; *A. squarrosus*, Hack. in DC. Monogr. Phan. vi. p. 542.]

Ill.—Duthie, Fodder Grasses, N. India t. 15.

Vernac. names.—Khas Khas, Vetiver (India, *Stapf*, *Watt*); Bena (India, *Duthie*); Yerba Moro, Raiz de Moro (Philippines, *Blanco*); Akar wangi (Malay, *Stapf*); Vetivert or Vetiver Root, Khus-Khus or Cus-Cus root, Sweet Grass.

Tropical Asia—wild and cultivated; known in Tropical Africa from the French Congo and Belgian Congo and probably spread by cultivation to other parts of the Continent, including Nigeria; in other tropical countries—S. America, West Indies, etc.

Rhizomes or roots, aromatic, the source of " Vetiver Oil "—remarkable amongst essential oils for its viscid character—of Commerce, usually extracted in Europe from imported roots, Tuticorin—Coromandel Coast being the principal country of export. A report to Kew on a sample of " Khus-Khus " root from Trinidad, made by a firm in London July 1913 states " We have shown your sample of ' Trinidad ' to several of our buyers and we gather that the value is about 7*s.*–8*s.* per cwt., possibly rather over, as it is free from chumps; we cannot however recommend consignments of this article "; " but on the other hand of " Vetivert Root " from Colombia in March 1916 it was reported by another London firm that " the sample of Vetivert root is very good, clean and good flavour—if bulk as per sample, to-day's value is 40*s.*–45*s.* per cwt.; can your friends ship a parcel at once, it is much wanted " (Mus. Kew). In 1914, Vetiver was exported from Reunion to the amount of 2750 lb. at an average price of £1 12*s.* per kilo (Cons. Rep. Ann. No. 5530, 1915, p. 7). The value to-day (1921) is for the oil (Reunion) 45*s.* per lb. (Perfumery & Ess. Oil Rec. Jan. 1921, p. 32) down to 34*s.* per lb. (l.c. March 1921, p. 98) in London.

The oil is used in perfumery; the finest roots are made into little bunches for putting away with clothing and the powdered root is an ingredient in sachet powders in this country and the root is used for perfumery and medicinal purposes in India (Stapf, Kew Bull. 1906, p. 348; Watt, Comm. Prod. India, p. 1106); roots used for making the scented and aromatic mats which are hung in doorways and kept wet to cool the atmosphere during the hot season and for baskets and fancy articles in India (l.c.) and the grass is used for thatching coolie huts in Mauritius (Agric. News, Barbados, June 10th 1911, p. 188); in universal demand for thatching purposes and when young affords good fodder, India (Watt, l.c.).

The plant grows 6 ft. or so high; it may be easily propagated by division of the root-stock, requires a warm climate, good soil in moist situations or near river banks. In Mauritius it is said to be usually planted all round the cane fields in order to prevent the spread of " Devil's grass " (*Cynodon Dactylon*) from the estate roads on to the cultivated land (Agric. News, Barbados, l.c.). When grown on a commerical scale the plants are set out in rows about 1½ metres apart; 65 rows to the hectare, a total of 6500 metres representing about 43,000 roots. In the

second year the plantation will give from 30,000 to 35,000 kilos. of roughly skaken roots which after washing will yield about 2½ tons of cleaned marketable product; this weight in bales amounts to about 16 cubic metres, which at Marseilles or Bordeaux is worth about 720 francs per ton (Perfumery & Ess. Oil Record, Feb. 20th 1913, p. 42).

The yield of oil from the dry root is 0·4–0·9 per cent. (Kew Bull. 1906, p. 362). Owing to the low volatility and great viscosity of the oil, distillation is very tedious, each charge being in the still from 12–16 hours; the production of 1 kilo is estimated to cost 20 francs and with the average selling price at 30 francs this yields a profit of 10 francs per kilog. or 250 francs per hectare (Perfumery & Ess. Oil Rec. l.c.).

Ref.—*Andropogon muricatus* "in Dict. Econ. Prod. India, Watt, i. 1889, pp. 245–247.——" Oil of Vetiver," in The Volatile Oils, Gildemeister & Hoffmann, pp. 289–291.——" *Vetiveria zizanioides*," Stapf, in Kew Bull. 1906, pp. 346–349; pp. 362–363. ——" *Vetiveria zizanioides*" in Comm. Prod. India, Watt, p. 1106 (John Murray, London, 1908).——" Oil of Veti-vert," in The Chemistry of Essential Oils, Parry, pp. 184–186.—— " Vetiver," in the Perfumery & Essential Oil Record, iv. Feb. 20th, 1913, p. 42; " Oil of Vetivert or Cuscus grass (Khas Khas)," l.c. June 11th 1915, p. 168.——" Tropical Sweet Grass in Trinidad," in Journal of the Royal Society of Arts, lxix. Jan. 28th, 1921, p. 161.——" Vetiver Oil from India," Bull. Imp. Inst. xviii. 1920, pp. 345–346.

AMPHILOPHIS, Nash.

Amphilophis glabra, *Stapf*; Fl. Trop. Afr. IX. p. 172.

Ill.—Trinius, Sp. Gram. Ic. t. 328 (*Andropogon punctatus*).

Katagum (Dalziel, No. 257, Herb. Kew), B.E. Africa (Kenya Colony), Belgian Congo, Angola, East Africa and widely distributed in Tropical Asia; found in N.E. Australia and in Madagascar.

Yields a quantity of feed during the summer months, Australia (Maiden, Useful, Nat. Pl. Austr. p. 73—*Andropogon intermedius*, R. Br.).

A perennial with culms 3 ft. high and upwards.

Amphilophis intermedia, *Stapf*; Fl. Trop. Afr. IX. p. 174, (?) var. **acidula,** *Stapf*, l.c. [*Andropogon pertusus*, Stapf, Kew Bull. 1895, p. 209].

Gold Coast, Cape Verde Islands, Angola, Barbados, Nevis, and Guiana.

A perennial, 3 ft. high and upwards, propagated by division of the root. A fodder plant cut at the early flowering stage; yield in Barbados, where it is called "Sour Grass," 5–7 tons per acre per annum. It is recommended for dry limestone soils, for grazing or cut for hay, fed to cattle alone or mixed with a little molasses and oil-cake. The appearance of pastures in

Barbados is said to resemble English hay-fields (Kew Bull. 1895, p. 210—*Andropogon pertusus*).

Amphilophis pertusa, *Stapf*; Fl. Trop. Afr. IX. p. 175. [*Andropogon pertusus* Willd., Sp. Pl. iv. p. 922].

Ill.—Beauvois, Agrost. t. 23, f. 2 (*Andropogon pertusus*).

Sour Grass.

Cape Verde Islands, Eritrea, Abyssinia, Somaliland, Mozambique, Arabia, India, Ceylon, Mauritius, Jamaica.

A perennial; propagated by division of the roots and stands drought well. An important fodder grass in the plains of N. India, both for grazing and stacking. It is considered excellent fodder for bullocks etc. and for horses when green and is grazed by buffaloes (Kew Bull. l.c. p. 209—*Andropogon pertusus*).

Schizachyrium, Nees.

Schizachyrium exile, *Stapf*; Fl. Trop. Afr. IX. p. 191.

Vernac. names.—Jan ranno, Jan ramno, Jan banje, Jan bako, ramno (Hausa, Sokoto, *Dalziel*).

Sokoto, Katagum, Lokoja in N. Nigeria, also in Shari region, Nileland and India.

Used for thatching and chopped up to mix with building clay or mud for building huts, and also as a fodder grass in Sokoto and Katagum (Dalziel, Nos. 251 & 259, Herb. Kew, 1910; Hausa Bot. Voc. p. 50—*Andropogon exilis*).

An annual $1\frac{1}{2}$–2 ft. high, turning russet red in Autumn (October and November) Sokoto (l.c.).

Andropogon, Linn.

Andropogon gayanus, *Kunth*; Fl. Trop. Afr. IX. p. 261. and varieties **genuinus**, Hack, **bisquamulatus,** Hack, **squamulatus,** Stapf; all widely distributed in Tropical Africa.

Vernac. names.—Gamba (Hausa, *Dalziel*); Eruwa funfun (Lagos, *Dodd*); Ikboago (Aguku, S. Nigeria, *Thomas*).

A commonly used grass for "zana," N. Nigeria (Dalziel, l.c. p. 32); pulp suitable for making paper (Bull. Imp. Inst. 1921, p. 275).

A perennial, 10 ft. high, moist places, Nupe (Barter, Herb. Kew) 8 ft. high, Lokoja; 4–6 ft. high, Katagum (Dalziel, Herb. Kew), a tuft grass found on the edge of cultivated patches, Opobo (Jeffreys, Herb. Kew).

Andropogon pseudapricus. *Stapf*; Fl. Trop. Afr. IX. p. 242.

Vernac. names.—Jan bako, Jan bauje (Sokoto, *Dalziel*).

Sokoto, Nupe, Katagum, Lokoja in N. Nigeria.

Used for thatching, Sokoto (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 50—*A. apricus*, var *africanus*).

An annual; 2–4 ft. high; found in rice fields, Nupe (Barter, Herb. Kew), turning russet in November, Sokoto (Dalziel, l.c.).

Andropogon tectorum, *Sch. et. Thonn.*; Fl. Trop. Afr. IX. p. 257.

Vernac. name.—Damba (Hausa, *Dalziel*).

Lagos, Yola (Dalziel, Herb. Kew); Obeyon, Ogurude (Holland, Herb. Kew), Sierra Leone, French Guinea.

Used as fodder when young and for fencing when mature, (Dalziel, l.c. p. 20–? *A. tectorum*); recommended for paper-making, shipped as "half-stuff," Nigeria (Bull. Imp. Inst. 1921, p. 274).

A tall grass, 6–10 ft. high, found in marshes (Dalziel ll.cc.); 8–20 ft. high; one of the commonest grasses of Sierra Leone, sometimes covering many square miles (Scott Elliot, Smythe).

CYMBOPOGON, Spreng.

Cymbopogon citratus, *Stapf*; Fl. Trop. Afr. IX. p. 282 [*Andropogon citratus*, DC. Cat. Hort. Monsp. p. 78].

Ill.—Rumpf, Herb. Amb. v. t. 72 (*Schoenanthum amboinicum*); Kew Bull. 1906, p. 357 (*Andropogon citratus*); Hook. Ic. Pl. t. 2826 (*C. citratus*); Hood, U.S. Dept. Agric. Bull. No. 442, 1917, pp. 2–4, ff. 1–3.

Vernac. names.—There are numerous vernacular names enumerated in Kew Bull. l.c. p. 358 (*q.v.*); but the grass is well known everywhere as Lemon Grass or Citronelle (French) [the true "Citronella Grass" is *C. Nardus*, Rendle], and translations of local names give Orange Grass, Perfume Grass, Camphor Grass (l.c.).

Old Calabar, Lagos and at probably all stations in Southern Nigeria; Gold Coast in French Guinea, Ivory Coast and Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 387); India, Malaya, Philippine Islands and under cultivation more or less throughout the Tropics.

An oil is obtained from the leaves used in perfumery. Imports of oil come chiefly from Ceylon and Straits Settlements. The value for "Lemon Grass Oil" on the London Market during 1920 varied from 7*d.* to 1*s.* 5*d.* per oz. (Perf. & Ess. Oil Rec. Dec. 1920, p. 406) and in April 1921—"average price on spot 5*d.* per oz. with forward at 4½*d.* c.i.f. (l.c. April 1921, p. 126).

A perennial; propagates readily by division of the roots, and grows freely; in well-drained good soil; suitable for bordering walks &c. Cultivated everywhere more or less for this purpose and for decoration. It has been grown experimentally and the oil produced in small quantities in Java, Tonkin, West Africa, Brazil, Florida and the West Indies; but the production is said to be inferior to East Indian "Lemon-grass oil" (*C. flexuosus*, Stapf)—the Malabar or Cochin Grass (Kew Bull. *seq.* p. 334).

In the Malay Peninsula—planted out 2 ft. × 3 ft. apart (7260 to the acre), it is stated that the crop will be ready for harvesting in the third year. The grass is put into the still with as little delay as possible. In plantation-grown grass at least two crops can be harvested in the season, so that, calculating on

the average, on a bundle of the grass (6 in. diam.) from each of the clumps (5000) which may be safely counted upon to attain maturity out of the 7260 planted out, the yield of an acre may be estimated at 10,000 bundles; fifty such bundles yield a quart (40 fluid ounces) of the oil, so that the total yield would be 200 quarts or 8000 ounces (Kew Bull. 1906, p. 364). In Brazil the yield from fresh grass, according to season, is given at 0·24–0·4 per cent. (l.c. p. 358). In Central Florida it is recommended that the plants may be cut for the first time at from 4–5 months after planting. Close cutting is not considered profitable. It has been found by experiment that plants cut when 2 ft. high, divided into three 8 in. lengths and distilled separately, that the yield per cent. of oil from each portion was —upper third 0·46, middle third 0·24 and lower third 0·1, the citral content of these oils being 70, 78 and 82 per cent. respectively. The yield of oil has been found to be on green material —fresh, 78·1 lb: 0·37 per cent. of oil; sun-dried, 93·1 lb., 0·31 and artificially dried in 100·3 lb., 0·32 per cent. of oil. The yield per acre is given at 25 lb. of oil for the first year and 35 lb. of oil for succeeding years (Hood, *seq.*).

The grass may be grown as a catch-crop in rubber plantations and it has been recommended for cultivation in places where the "Tsetse" fly (*Glossina palpalis*)—which conveys sleeping sickness—is found in Tropical Africa as it is said to be obnoxious to this insect (Bagshawe, Herb. Kew—specimen from Port, E. Africa).

Ref.—"Lemon-Grass Oil" in The Volatile Oils, Gildemeister & Hoffmann, pp. 285–289 (Pharmaceutical Review Pub. Co., Milwaukee, 1900).——"*Cymbopogon citratus*," Stapf, in Kew Bull. 1906, pp. 322–335; pp. 357–358.——"Cultivation of Lemon Grass in the Malay Peninsula," l.c. p. 364.——Lemon Grass in Ceylon, Wright & Bamber, Roy. Bot. Gdn. Ceylon, Circ. No. 19, Dec. 1906, pp. 263–270.——"Lemon Grass Oil Cultivation in Comm. Prod. India, Watt, pp. 457–460.——"Lemon Grass," Col. Rep. Misc. No. 64, 1909, Uganda, pp. 9–10 with particulars of a Still.——"Lemon Grass Oil" in The Chemistry of Essential Oils, Parry, pp. 176–180.——"Lemon Grass Oil," Parry, in The Perfumery and Essential Oil Record, iv. Feb. 20th, 1913, p. 40.——Possibility of the Commercial Production of Lemon Grass Oil in the United States, Hood, U.S. Dept. Agric. Bull. No. 442, 1917, pp. 1–12.——"Lemon-Grass Oils from Seychelles," Bull. Imp. Inst. xviii. 1920, ("Aromatic Grass Oils"), pp. 340–342.

Cymbopogon giganteus, *Chiov.*; Fl. Trop. Afr. IX. p. 288.

Vernac. names.—Tsabre or Tsaure (Hausa, *Dalziel*); Maragra, Nor (Sudan, *Broun*); Benifalu (Gambia, *Dawe*).

Sokoto, Kontagora, Lagos &c. in Nigeria, also known from Cameroons, Gold Coast. Sierra Leone, Zambesi, Sudan and Rhodesia.

Used for fencing, screens, &c. Hausaland (Dalziel, Hausa Bot. Voc. p. 93), as forage when young, Gold Coast (Johnson, Herb. Kew) and as a febrifuge, Gambia (Dawe, Rep. 1921, p. 6); pulp suitable for making paper (Bull. Imp. Inst. 1921, p. 278).

A perennial, up to 8 ft. high (Fl. Trop. Afr. l.c.); a tall fragrant grass, Sokoto (Dalziel, l.c. and No. 485, 1910, Herb. Kew) 6 ft. high and over, strong growing (Johnson, l.c.), in clumps among other grasses, in the delta, Zambesi (Kirk, Herb. Kew), about 6 ft. high, on rocky and stony ground, slopes of Morambala Mt, Lower Shire, E. Africa (Scott, Herb. Kew).

Cymbopogon Nardus, *Rendle* in Cat. Welw. Afr. Pl. ii. (1899) p. 155 [*Andropogon Nardus*, Linn. Sp. Pl. (1753) p. 1046].

A tall robust plant upwards of 5 ft. high or more, leaves broad. Panicle effuse with zig-zag branches, divaricate bracts; small spikelets and no well-developed awn (Trimen, Fl. Ceylon).

Vernac. names.—Panagiri mana, Maha Panagiri mana, Lenubatu Panagiri mana (Singhalese, *Stapf*); Pangiri Maana (Ceylon, *Trimen*).—Citronella Grass.

Ceylon, Java, Malay Peninsula, Hope Gardens in Jamaica. Cultivated, and like " Lemon Grass " only known under cultivation (Kew Bull. 1906, p. 355).

Yields an oil used in perfumery; imported chiefly from Ceylon, Malaya and Java. During 1920 Citronella Oil from Ceylon, varied from 2*s*. 1*d*. (lowest) to 3*s*. 6*d*. (highest) per lb. and that from Java 4*s*. 9*d*. to 6*s*. 3*d*. per lb. (Perf. & Ess. Oil Rec. Dec. 1920, p. 404). In April 1921 the London Market report was " Citronella oil is weak with Ceylon in original drums at 1*s*. 3*d*., 1*s*. 5*d*. to 1*s*. 6*d*. in tins, pure commands 1*d*. premium and " the Java distillate has receded to 2*s*. 9*d*. per lb. spot, with prompt shipment from Holland, offering at 2*s*. 6*d*. ex London warehouse " (l.c. April 1921, p. 126).

Propagated by division of the roots [the constant harvesting is calculated to prevent seeding] and grows freely in rich open soil in a climate with a heavy rainfall. Requires replanting after about 12 years. In Java where there are several large plantations —including one of 1000 acres it is estimated that from 10 acres a yield of 12 tons should be cut and four crops a year can be taken off, totalling 48 tons, yielding ½ per cent. or 4⅘ cwt. of oil. To obtain the oil from the grass by distillation a small plant is required, consisting of one boiler (£250) and a tank and condenser with pipe connection (£85). A round tank, 16 ft. in. diameter would be sufficiently large to treat four crops a year off 200 acres if worked day and night (Kew Bull. 1906, p. 363). The yield in Ceylon averages in the first and principal season (July to August) from 16–20 bottles (of 22 oz. each) per acre and from 5–10 bottles per acre for the second season (December to February), varying according to weather, age and location of the plantation (Gildemeister & Hoffmann, *seq.* p. 291); it has been (1905) 1,282,471 lb. of oil from 40,000–50,000 acres and in the Malay Peninsula (1903) about 30,000 lb. of oil from about

2000 acres, or from 110–440 oz. of oil, according to season, per acre (l.c p. 355). Recommended as a catch crop in Rubber and Coco-nut plantations.

Ref.—" Citronella Oil," in The Volatile Oils, Gildemeister & Hoffmann, pp. 291–299, with illustrations showing the construction of distilleries and a map of The Citronella-Oil Districts in Ceylon.——" *Cymbopogon Nardus*," Stapf, in Kew Bull. 1906, pp. 314–318; pp. 354–355.——" Cultivation of Citronella Grass in Java," l.c. p. 363.——" Citronella Oil," in The Chemistry of Essential Oils, Parry, pp. 168–176 (Scott, Greenwood & Son, London, 1908).——" Citronella Grass " in Bull. Imp. Inst. x. 1912, pp. 299–300 " Lenar batu."

Cymbopogon proximus, *Stapf*; Fl. Trop. Afr. IX. p. 271.

Vernac. name.—Nobe (Hausa, *Dalziel*).

Sokoto, Nupe, Sudan, Nubia, Abyssinia.

Much used for thatch, Sokoto (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 77).

A fragrant grass 2–3 ft. high, with very narrow leaves (l.c. —*C. sennariensis,* var. *proximus*), perennial, 3 ft. high in a " Dawa " (*Sorghum*) field, Nupe (Barter Herb. Kew).

Cymbopogon Schoenanthus, *Spreng.*; Fl. Trop. Afr. IX. p. 268. [*Andropogon Schoenanthus,* Linn. Spec. Pl. ed. 1 (1753), p. 1046].

Ill.—Hook, Ic. Pl. t. 1871 (*Andropogon laniger*).

Vernac. names.—[Izkhir (Arabic); Máhareb (Cairo, *Schweinfurth*); M'hâh (Hedjas, *Forskal*); Gor-giyah (Persian); Khavi (Hindustani, *Edgeworth*) *Stapf*].—Camel Grass, Wild Ass Grass (transl. of the Persian); Camel Hay.

North Africa—Morocco, Tunis; Arabia, Persia, Mesopotamia, Panjab and other parts of N. India; in Nile-land, Eritraea and Somaliland.

An oil is distilled from the leaves, which yield about 1 per cent. of the dry grass—sold in the bazaars of the Panjab for medicinal purposes (Stapf. Kew Bull. 1906, p. 353); and at one time it was used in perfumery—aromatizing oils by the Ancient Greeks and Romans (l.c. p. 312); Dr. Dymock distilled some of the fresh plant of " Camel grass "—which grows freely on the lower Himalayas and in Thibet—and states that the yield was 1 per cent. (Parry, Chem. Ess. Oils, p. 187).

It is not known if this grass has been cultivated in Africa, in the same way as the " Lemon Grass," but a note is made of it here because of the confusion that has existed with plants under the name *Andropogon Schoenanthus* and as " Lemon Grass."

Ref.—*Cymbopogon Schoenanthus*," Spreng, Stapf, in Kew Bull. 1906, pp. 303–313; pp. 352–353; see also Kew Bull. l.c. for information on " The Oil-Grasses of India and Ceylon—*Cymbopogon*, *Vetiveria* and *Andropogon* spp.," pp. 297–364, and " Perfume Yielding Grasses, *Cymbopogon* (*Andropogon*) " in

Comm. Prod. India, Watt, pp. 450–460 (John Murray, London, 1908).——"Oils-Gramineae—principally *Cymbopogon* (*Andropogon*)," in The Chemistry of Essential Oils, Parry, pp. 167–187 (Scott, Greenwood & Son, London, 1908).——"The Aromatic Grass Oils," in Bull. Imp. Inst. ix. 1911, pp. 240–253; pp. 333–340; x. 1912, pp. 27–34.

HYPARRHENIA, Anderss.

Hyparrhenia rufa, *Stapf*; Fl. Trop. Afr. IX. p. 304. [*Andropogon rufus*, Kunth, Enum. i. p. 492; *Cymbopogon rufus*, Rendle, Cat. Welw. Afr. Pl. ii. p. 155].

Vernac. names.—Yamma or Yama (Hausa, *Dalziel*); [Yamma (Sokoto), Mosseque or Mosoque (Angola) *Stapf*].

Sokoto, Abinsi, Katagum (Dalziel Nos. 487, 903, 266, Herb. Kew), Lokoja (Richardson No. 4, Herb. Kew), in N. Nigeria; Ogurude (Holland No. 276, Herb. Kew) in S. Nigeria in the Cameroons and almost throughout Tropical Africa; in the Mascarene Islands and in Brazil.

Commonly used for grass fencing in Nigeria and for thatching in Angola (Stapf, l.c.); used for "zana" (fencing) and thatch, Nigeria (Dalziel, Hausa Bot. Voc. p. 104—*Cymbopogon rufus*), and for similar purposes, Ogurude, Cross River (Holland); pulp suitable for making paper (Bull. Imp. Inst. 1921, p. 278).

A perennial up to over 8 ft. high common in meadows (ll.cc.).

Hyparrhenia Ruprechtii, *Fourn.*; Fl. Trop. Afr. IX. p. 326. [*Cymbopogon Ruprechtii*, Rendle, Cat. Welw. Afr. Pl. ii. p. 160; *Andropogon Ruprechtii*, Hack. D.C. *Monogr.* Ph. vi. p. 645; Stapf, Fl. Cap. vii. p. 365].

Vernac. names.—Kiara or Kyara (Katagum, *Dalziel*); Tambookie (S. Africa, one of the grasses under this name, Bull. Imp. Inst. 1919, p. 142).

Lagos, Lokoja, Katagum, Jeba, Quorra (Niger) in Nigeria and widely distributed in Tropical Africa extending to the East and Mozambique district, also in S. Africa, Madagascar and Tropical America.

Used for thatching, Katagum (Dalziel, No. 265, Herb. Kew); for mats, houses, etc. Lokoja (Richardson, Herb. Kew) and for fencing after the spikelets have fallen (Dalziel, Hausa Bot. Voc. p. 69—*Cymbopogon Ruprechtii*). This grass has been examined amongst others suggested for the manufacture of paper; it is very similar to the "Tambookie" grasses (*Andropogon Dregeanus* and *A. auctus*) of S. Africa. The stems of the sample were straw-coloured and had been cut up into lengths of about 3 ft.; they measured $\frac{3}{16}$ in. diam. and had hard nodes at intervals of 11–14 in. Yield of pulp good and of excellent quality (Bull. Imp. Inst. 1919, p. 142, 144).

A perennial up to 10 ft. high in caespitose clumps; a very common tall grass with sharp long awned spikelets (Dalziel, l.c.), the prevalent grass, Lokoja (Richardson, l.c.); small, densely

caespitose, culms light straw-coloured, stiffly erect, some 10 ft. high, gregarious along the moist depressions at the margins of Kwito river, Angola (Gossweiler, Herb. Kew).

Hyparrhenia soluta, *Stapf*; Fl. Trop. Afr. IX. p. 318. [*Cymbopogon solutus*, Stapf in Journ. de Bot. 2me ser. ii, p. 211, and in Chevalier, Sudania, p. 180].

Shari Territory (Chevalier).

Culms erect, stout, 4–5 ft. high.

Var. **violascens,** *Stapf.* l.c. p. 319.

Vernac. names.—Gajiri, Jimpa Jimpa, Jimfi (Hausa, *Dalziel*).

Katagum, Abinsi, N. Nigeria (Dalziel, No. 263, 1908, Nos. 890, 891, 1912, Herb. Kew).

Used for thatching and for "zana" (fencing) in Sokoto (Dalziel, Hausa Bot. Voc. p. 32—*Cymbopogon hirtus*).

A tall grass (l.c.).

Hyparrhenia subplumosa, *Stapf*; Fl. Trop. Afr. IX. p. 366.

Vernac. names.—Tsikar daji, Tsikardawa, Kibiyar daji, Tuma da gobara (Sokoto, Hausa, *Dalziel*).

Lokoja (Dalziel No. 298, Herb. Kew), Abinsi (*Idem.* Nos. 889, 901, l.c.) in N. Nigeria, and in Sierra Leone, French Guinea, Togoland and other parts of Upper Guinea.

Used for thatch, Sokoto (Dalziel, Hausa Bot. Voc. pp. 95, 97 —*Cymbopogon diplandrum*, Hack. var.).

A perennial, up to over 10 ft. high, a tall grass covering large areas of uncultivated ground and very abundant in the bush (ll.cc.).

It is suggested that the same particulars may also apply to *H. diplandra*, Stapf (*Andropogon diplandrus*, Hack. Fl. Trop. Afr. ix. p. 368, a perennial up to over 12 ft. high, known from Southern Nigeria, the Cameroons and almost throughout Tropical Africa. It is stated (Dalziel, l.c.) that other tall species of the same genus are probably included under the native names. Most of the grasses of this character appear to be used for thatch or fencing and amongst other *Hyparrhenias* which may possibly be included for the purpose are *H. chrysargyrea*, Stapf—an annual, culms erect up to over 5 ft. high, Lokoja (Dalziel, No. 293, Herb. Kew; Fl. Trop. Afr. ix. p. 312); *H. Barteri*, Stapf—an annual, culms erect, slender up to 6 or even 8 ft. high, Lokoja (Dalziel, No. 295, Herb. Kew), confluence of the Niger and Benue rivers, Cameroons and Upper Oubangui (Fl. Trop. Afr. ix. p. 321); *H. cymbaria*, Stapf—perennial, 6–20 ft. high, Cameroons and widely distributed in Tropical Africa (l.c. p. 332) and *H. notolasia*, Stapf—annual, culms robust up to 2 lin. diam. 8–10 ft. high, Lokoja (Dalziel, No. 299, Herb. Kew and l.c. p. 377).

MONOCYMBIUM, Stapf.

Monocymbium ceresiiforme, *Stapf*; Fl. Trop. Afr. IX. p. 387.

Ill.—Hooker, Ic. Pl. t. 1870 (*Andropogon ceresiaeformis*).

Vernac. name.—Bayan mariya (Hausa, *Dalziel*).

Abinsi (Dalziel, No. 893, Herb. Kew), Lokoja (Dalziel No. 284, Herb. Kew), Jeba (Barter, Herb. Kew) in Nigeria and found in French Guinea, French Congo, Angola, Tanganyika Territory, Nyasaland and Natal.

Much used for thatch (Dalziel, Hausa, Bot. Voc. p. 15—*Andropogon ceresiaeformis*).

A perennial, most densely caespitose, 1–4 ft. high.

HETEROPOGON, Pers.

Heteropogon contortus, *Roem. & Schult.*; Fl. Trop. Afr. IX. p. 411. [*Andropogon contortus*; Linn. Sp. Pl. (1753) p. 1045.]

Ill.—Beauvois, Agrost. t. 23, f. 8 (*H. glaber*); Lam. Encycl. t. 840 (*Andropogon contortus*); Rchb. Ic. Fl. Germ. i. t. 53, ff. 1496–7 (*Heteropogon Allionii*); Duthie, Indig. Fodder Gr. N. India, t. 19; Vasey, Grasses, U.S. Dept. Agric. Bot. i. 1891, p. 16; Agric. Gaz. N.S. Wales, iii. Nov. 1892, t. 53; Wood, Natal Pl. ii. t. 121 (*A. contortus*); Engler & Drude, Veg. Erde, ix. (1910) p. 565, f. 502 (*A. contortus*); Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 274, f. 165.

Vernac. names.—Bunsurundaji (Hausa, *Dalziel*); Sarala (India, *Duthie*); Pili (Hawaiian Islands, *Hitchcock*); Aggar (Somaliland, *Drake-Brockman*).—Spear Grass, Bunch Spear Grass, Wild Oats.

Tropical Africa and throughout the Continent in India, the Mediterranean region and widely spread in many tropical and sub-tropical countries.

The grass is used as a fibre in the manufacture of coarse mats and for thatching in India where it is also largely used as a fodder plant, both before and after it has flowered, but chiefly when it is young and tender; in Rajputana and Bundelkhand it is the principal fodder-grass, cut and stacked after the rains; it is said that the hay will keep good in stack for 12 years (Watt, Dict. Econ. Prod. India). In Australia, in an ordinary season on deep rich soils it produces a great bulk of herbage which cattle eat readily whilst it is young; but when it becomes old the stems get wiry and the foliage harsh, and it is then seldom or never eaten if other herbage is plentiful; although an excellent grass to encourage on a cattle-run it is not recommended on sheep-runs—the sharp-pointed seeds not only injure the wool, but they often enter the skin and vital parts of the animals (Turner, Agric. Gaz. N.S. Wales, iii. Nov. 1892, p. 857). "A splendid grass for a cattle-run as it produces a great amount of feed; but is dreaded by the sheep owner on account of its spear-like seeds" (Maiden, Useful Native Pl. Aust. p. 90) and in general it is described as a good fodder grass when young; but very troublesome and even dangerous when mature on account of the sharply pointed calli of the fertile spikelets, which penetrate the skin and membranes of the mouth—hence the

name "Spear Grass" (Fl. Trop. Afr. l.c. p. 413); in Somaliland it "causes much trouble to ponies, the spears sticking in their mouths" (Appleton, Kew Bull. 1907, p. 211).

Leaves, "half-stuff" (yield 50 per cent.) and paper pulp (yield—bleached, 25 per cent.) were presented to the Kew Museum in 1882 by Mr. Thomas Routledge and some further experiments have been made in India recently, for particulars see the paper by Raitt, quoted under *Saccharum spontaneum*.

A perennial up to 3 ft. or so in height, and judging by the wide distribution not very choice as to soil.

THEMEDA, Forsk.

Themeda quadrivalvis, *O. Kuntze*; Fl. Trop. Afr. IX. p. 420.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 175 (*Anthistiria ciliata*); Lam. Encycl. t. 841, f. 1 (*A. ciliata*); Beauvois, Agrost. t. 23, f. 7 (*A. ciliata*); Duthie, Fodd-Grass. N. India, t. 61 (*A. scandens*)

Vernac. names.—Musel (India, *Watt*). The Kangaroo Grass, of Australia (Watt).

Native of India, known in Africa from the Belgian Congo and probably more widely spread.

Used as fodder in India, where it is said to be one of the most useful and in Australia it is much valued as one of the chief grasses for feeding cattle (Watt, Dict. Econ. Prod. India.—*Anthistiria ciliata*, Linn.).

Themeda triandra, *Forsk.*; Fl. Trop. Afr. IX. p. 416.

Ill.—Wood, Natal Pl. ii. t. 133 (*Anthistiria imberbis*); Transv. Agric. Journ. iii. Jan. 1905, t. 52 (*Anthistiria imberbis*); Desf. Fl. Atlant. ii. t. 254 (*A. glauca*).

Vernac. names.—Rooi (South Africa, *Burtt-Davy, Stapf*); Insinda (Natal, *Wood*).

Upper Guinea—French Guinea and French Sudan and widely distributed in Tropical Africa and said to be one of the commonest grasses of the drier regions of Africa. Also in India, Malaya and Australia (Kew Bull. 1907, p. 212).

A valuable fodder grass, said to be one of the most useful fodder grasses of the veldt as well as one of the commonest; it is a good hay grass and liked by stock of all kinds; but it should be cut before the seed heads turn brown, Transvaal (Kew Bull. 1911, p. 159—*Themeda Forskalii*, Hack—*Anthistiria imberbis*, Retz.); one of the most useful grasses for all kinds of stock in spring and summer, gets very dry in winter, Natal (Wood, l.c.).

A variety from South Africa has been found to yield about the same quantity and quality of pulp as "Tambookie" (*Andropogon*); but the nodes are harder and a disadvantage on a commercial scale for export and it was suggested to confine its use as a paper-making material to South Africa (Bull. Imp. Inst. *seq.*).

A perennial $1\frac{1}{2}$–4 ft. high; 1–3 ft. densely tufted, hill tops and upland slopes, Natal (l.c.); a tufted perennial about 3 ft.

high, which covers vast areas of plain and hillside at altitudes varying from 2000–6000 ft. above sea level; thrives best in a well drained heavy black loam in the Transvaal (Burtt-Davy, *seq.*).

Ref.—" Rooi-Grass (*Anthistiria imberbis*) in " Native Forage Plants," Burtt-Davy Transvaal Agric. Journ. iii. Jan. 1905, pp. 287–288.——" *Themeda Forskallii* var. *mollissima*," in " Investigations of Materials Suggested for the Manufacture of Paper " Bull. Imp. Inst. xvii. 1919, pp. 145–146.

Digitaria, Hall.

Digitaria acuminatissima, *Stapf*; Fl. Trop. Afr. IX. p. 441.

Vernac. name.—Makari? (Hausa, *Dalziel*).

Abinsi, N. Nigeria and in French Sudan.

Used as fodder, Abinsi (Dalziel, No. 907, Herb. Kew).

Annual; culms erect, over 2 ft. high; a grass cultivated in some districts with a small grain [linear-oblong, plano-convex (Stapf, l.c.)] like " Acha "—*D. exilis*, Stapf (Dalziel, Hausa Bot. Voc. p. 74—" Makari," *Digitaria* sp.).

Digitaria debilis, *Willd.*; Fl. Trop. Afr. IX. p. 464.

Ill.—Figari & De Notaris, Mem. Ac. Torin, xiv. (1853) t. 23 (*D. variabilis*); t. 24 (*D. decipiens*); Wood, Natal Pl. v. t. 469.

Vernac. name.—Harikia or Harkiya (Katagum, *Dalziel*).—Finger Grass (*Dalziel*).

Katagum, Sokoto, Abinsi in N. Nigeria; Lagos in S. Nigeria and in Kordofan (Nile Land), Angola, Portuguese East Africa, Nyasaland, Natal, and Mediterranean region—Algeria, South Italy, Portugal, etc.

Fodder for horses, Katagum (Dalziel, No. 254, Herb. Kew).

Annual, culms 1–2 ft.; a common fodder grass 1½–2 ft. high (Dalziel, Hausa Bot. Voc. p. 48) found in meadows, Sokoto (*Ibid.* No. 496, Herb. Kew); cultivated in Native Gardens, Natal (Fl. Trop. Afr. l.c.).

Digitaria exilis, *Stapf*; Fl. Trop. Afr. IX. p. 470. [*Paspalum exile*, Kippist, Proc. Linn. Soc. i. p. 157; *P. longiflorum*, Cheval. Mission au Senegal, p. 241.]

Ill.—Ann. l'Inst. Col. Marseille, ix. 1902, t. 8 (*Paspalum longiflorum*); Kew Bull. 1915, p. 385; Hook, Ic. Pl. t. 3068.

Vernac. names.—Acha (Hausa, *Dalziel, Lamb, Elliott, Dudgeon*); Intaya (Hausa, *Dalziel*); Fundi (Sierra Leone, *Schön, Clarke, Stapf*); Fonio (Senegal & Upper Niger, *Dumas*); Foundounie (French Guinea, *Dybouski*); Fonio (Bambara, French Sudan, *Chevalier, Pobeguin, Stapf*); Fundengi or Fundingi, Fundi (Sierra Leone, *Thomas*).—Hungry Rice of Sierra Leone.

Zaria, Nassarawa in Nigeria, and also known from Sierra Leone, French Guinea and Togoland.

A small grass cultivated as a cereal in several Hausa Provinces in Bornu and by many Pagan tribes (Dalziel, Hausa Bot. Voc.

p. 6); seeds eaten made into porridge, cultivated Loko-Nassarawa (Elliott, Herb. Kew); seed made into flour for the preparation of a kind of porridge, Gambia and N. Nigeria (Dudgeon, Agric. & For. Prod. W. Afr. pp. 12, 148); the principal food of the natives, French Guinea (Pobeguin, Herb. Kew); the taste is so pleasant that even Europeans relish it (Chevalier, Mission au Senegal, p. 241). In Sierra Leone, "in preparing this delicious grain for food," it is first thrown into boiling water, stirred for a few minutes, the water then poured off and palm-oil, butter or milk added; the Europeans and Negroes also stew it with fowl, fish, or mutton, make it into a pudding or milk porridge (Kew Bull. 1915, p. 384); the natives here (Koinadugu District) are accustomed to plant large quantities of Fundi whenever they consider the rice crop is likely to fail (Stanley, Sierra Leone Gaz. 21st Nov. 1914).

An annual plant, about $1\frac{1}{2}$ ft. high. The seed is very small—53,000 grains to the ounce—flourishing in light soils and even in rocky situations (Kew Bull. l.c.); requires comparatively little moisture (Stanley, l.c.); grown in the fields with millet and attains a height of about 2 ft. (Dudgeon, l.c. p. 148); sown broadcast as a field crop in the Hausa States (Lamb, Herb. Kew) and cultivated largely by the Pagan tribes on the Bauchi Plateau at an altitude of 4000 ft., where the soil is for the most part poor and sandy (Kew Bull. l.c.). A plot 70 ft. by 70 ft. in Nassarawa Province, sown broadcast with "Atcha Grain," with 12 lb. of seed, May 26th and harvested Sept. 26th, yielded 361 lb. of grain in good condition (Creig, Nig. Gaz. 2nd April, 1914, p. 721); but a yield of only 51 lb. per acre is reported (Rae, Ann. Rep. Dept. Agric. N. Nigeria, 1914, p. 13). In Sierra Leone, sown in May and June, the grass ripens in September growing to the height of about 18 in., it is reaped with hooked knives, tied up into small sheaves and placed in a dry situation in the huts; the grain is trodden out with the feet, then parched or dried in the sun to facilitate removal of the chaff by pounding—which is done in wooden mortars—afterwards being winnowed with a kind of cane fanner on mats (Kew Bull. l.c. p. 383).

Various yields of "Acha"—150 lb. per acre for 5 years under cultivation in stony soil, 156 lb. for 3 years in light sandy soil and 145 lb. of grain per acre for 7 years in low lying good soil, have been obtained in the Zuru Sakaba Division, N. Nigeria (Boyd, Kontagora Province, N. Nig. Gaz. June 30th 1913, Suppl. p. 244).

Ref.—"Sur une Graminee du Soudan," Dybowski, in Compt. Rendus Acad. Sci. Paris cxxvi. 1898, pp. 771–772.——"Culture du Fonio dans les Vallees du Senegal et du Haut-Niger, Dumas, in L'Agric. pratique du Pays Chauds, v. 2, 1905, pp. 357–367.——"Fundi," stapf, in Kew Bull. 1915, pp. 383–386.

Digitaria gayana, *Stapf*; Fl. Trop. Afr. IX. p. 449. [*Panicum gayanum*, Kunth, Rev. Gram. i. p. 239.]

Ill.—Kunth, Rev. Gram. i. t. 31 (*Panicum gayanum*).

Vernac. names.—Karani, Darumba or Darambuwa (Hausa, Sokoto, *Dalziel*); Ba-Fillatani (Hausa, *Dalziel*—a name also applied because of the pale colour of the grass, and given to other plants for the same reason, Hausa Bot. Voc. p. 57).

Lagos, Sokoto, Bornu, Nupe etc. in Nigeria, also known from Senegal, Sudan, British East Africa (Kenya Colony) and the Belgian Congo.

Grass used to make plaited armlets etc. Sokoto (Dalziel, Herb. Kew).

An annual, 1–4 ft. high, in cultivated ground, Nupe (Barter, Herb. Kew), a common grain of waste fields etc. Sokoto (Dalziel, Herb. Kew).

Digitaria horizontalis, *Willd.*; Fl. Trop. Afr. IX. p. 436.

Ill.—Wood, Natal Pl. ii. t. 140.

Vernac. names.—Eran (Lagos, *Dawodu*); Ilu egugo egu (Aguku, S. Nigeria, *Thomas*); Okebuni, Ndewe (Sierra Leone, *Thomas*).

Lagos, Old Calabar, Opobo, Nupe, Abinsi, Aquku District Benue River, Lokoja, etc. in Nigeria and widely spread in Tropical Africa—Sierra Leone to the Cameroons in the West; Nubia to Somaliland and British East Africa (Kenya Colony) in the Nile region; Gaboon to Angola in Lower Guinea and German East Africa (Tanganyika Territory) to Nyasaland, Portuguese Territory, Rhodesia and Gazaland in the Mozambique District; also in Natal, Mascarene Islands, Tropical America, India and Malaya.

A grass much used for feeding horses, Lagos (Dawodu, Herb. Kew); the main local fodder for cattle, Lagos (Governor, Lagos to Sec. of State, letter dated Jan. 23rd 1900: Col. Office to Director Kew, Feb. 28th, 1900); considered a good feeding grass in Somaliland (Appleton, Herb. Kew and Kew Bull. 1907, p. 212).

An annual, varying in height from 1–several ft.; a free growing grass with plenty of leaf, Somaliland (Appleton, l.c.); found about villages, Nupe (Barter, Herb. Kew).

Digitaria Iburua, *Stapf*; Fl. Trop. Afr. IX. p. 455.

Ill.—Kew Bull. 1915, p. 382; Hooker, Ic. Pl. t. 3069.

Vernac. names.—Iburu, Iboru or Aburu (Hausa, *Lamb, Dalziel, Dudgeon*).

Zaria and Hausaland in general.

A cereal cultivated for food; the grain is very small—over 40,000 to the ounce; less than 1 lin. long.

An annual, 18 in. or so high; sown in rows as a field crop, Zaria (Lamb, No. 54, Herb. Kew); much planted in Zaria and other districts (Dalziel, Hausa Bot. Voc. p. 48); grown in Northern Nigeria in the fields along with millet (Dudgeon, Agric. & For. Prod. W. Africa, p. 149.)

Ref.—"Iburu and Fundi, Two Cereals of Upper Guinea" Stapf, in Kew Bull. 1915, pp. 381–383.

Digitaria Lecardii, *Stapf*; Fl. Trop. Afr. IX. p. 450.

Nupe (Barter, Nos. 1358 & 1370, Herb. Kew), Yola (Dalziel, No. 274, 1909, Herb. Kew), French Soudan.

A good fodder-grass (Lecard, l.c.) 2½ ft. high and upwards; common in the bush, Yola (Dalziel, No. 274, Herb. Kew).

An annual, 3–4 ft. high, in cultivated ground and open plains, Nupe (Barter l.c.). The grain is tiny, only ⅗ lin. by ⅓ lin., white, elliptic-oblong, plano-convex (Fl. Trop. Afr. l.c.).

Digitaria longiflora, *Pers.*; Fl. Trop. Afr. IX. p. 469. [*Paspalum longiflorum*, Retz. Obs. iv. p. 15.]

Ill.—Teysmannia, xxiv. 1913, t. 6 (*Paspalum longiflorum*).

Vernac. name.—Entupu (River Nyasa, *Allen*).

Lagos, Opobo, in S. Nigeria and also known from Sierra Leone, French Guinea, French Congo, Belgian Congo, Gaboon, Angola, Somaliland, Uganda, German East Africa (Tanganyika Territory), S. Africa, Madagascar, Mascarene Islands, India and Malaya.

A pasture plant; an excellent lawn grass at Peradeniya and said to form a large proprtion of the swards about Colombo, creeping close to the ground and helping to bind the soil (Macmillan, Roy. Bot. Gardens, Ceylon, Circ. No. 1, Sept. 1911, p. 14—*Paspalum longiflorum*).

A perennial; culms in fascicles arising from a prostrate rooting base (Fl. Trop. Afr. l.c.); stems very slender; ½–1 ft. high, from a wide creeping rhizome (Baker, Fl. Mauritius, p. 431—*Paspalum longiflorum*).

Digitaria uniglumis, Stapf; Fl. Trop. Afr. IX. p. 474. [*Panicum uniglume*, A. Rich. Tent. Fl. Abyssinia, ii. p. 370.]

Nile Land—including Abyssinia, Eritrea, Uganda, British East Africa (Kenya Colony)—in Nyasaland and Rhodesia.

A perennial culms 2–4 ft. high.

Var. **major,** *Stapf*, l.c. p. 476 [*D. diagonalis*, Rendle, Cat. Welw. Afr. Pl. ii. p. 163: *Panicum uniglume*, Jardin, Herbor. p. 7.]

Lagos (MacGregor, No. 208, Herb. Kew); Cameroons, French Equatorial Africa, Gaboon, Belgian Congo, Angola, and Nyasaland.

Culms up to 10 ft. high.

BRACHIARIA, Gris.

Brachiaria distichophylla, *Stapf*; Fl. Trop. Afr. IX. p. 557.

Vernac. names.—Funfure, Sirilinyaxa (Sierra Leone, *Thomas*).

Lagos, Opobo, Ebute Metta in S. Nigeria; Lokoja, Nupe, Sokoto, Niger and Benue region in N. Nigeria; also known from Senegambia, Gold Coast, Belgian Congo, Angola, French Guinea.

An excellent pasture grass; the ordinary fodder for Hippopotami all the year round (Lécard, Herb. Kew).

Annual, culms slender, ½–1½ ft. high, forming dense carpets, Ségou, French Guinea (Lécard, Herb. Kew) found in shady

ravines and about villages on cultivated ground, Nupe (Barter, Herb. Kew), common in fields, Sokoto (Dalziel, Herb. Kew) and in sand, Belgian Congo at 800–2000 ft. (Hens, Herb. Kew).

Brachiaria fulva, *Stapf*; Fl. Trop. Afr. IX. p. 518. [*Panicum falciferum*, Durand & Schinz.]

Vernac. name.—Makarin fako (Hausa, Katagum, *Dalziel*).

Katagum, Abinsi, Nupe, Onitsha and Lokoja in Nigeria, has been collected also in the Gambia, French Guinea, Cameroons, Angola, Abyssinia and B.E. Africa.

Seeds edible, sometimes gathered for food in Hausaland (Dalziel, Hausa Bot. Voc. p. 74—*Panicum falciferum*).

A perennial, up to 3 ft. high (Fl. Trop. Afr. l.c.) 1½–2 ft. high, with golden hairy flowering spike, Katagum (Dalziel, l.c.), in dry localities, Nupe (Barter, Herb. Kew), in marshy places, Angola (Welwitsch, Herb. Kew).

Brachiaria mutica, *Stapf*; Fl. Trop. Afr. IX. p. 526. [*Panicum barbinode*, Trin. Sp. Gram. Ic. t. 318; *P. muticum*, Forsk. Fl. Aegypt—Arab. p. 20.]

Ill.—Trinius, Sp. Gram. Ic. t. 174 (*Panicum numidianum*); t. 318 (*P. barbinode*); Vasey, Agric. Grasses (Ed. 1) t. 6 (*P. barbinode*), (Ed. 2) t. 12 (*P. barbinode*); Queensland Agric. Journ. xxi. 1908, p. 18, t. 3 (*P. barbinode*—after Trinius, t. 318).

Vernac. names.—Sari-zaba (Tigre, *Schweinfurth*); Para Grass, Mauritius Grass, Water Grass, Scotch Grass, Buffalo Grass.

Nupe, Sokoto in N. Nigeria and in the Cameroons, Senegal, Liberia, Sudan, Gaboon, Belgian Congo, German East Africa (Tanganyika Territory). Native of South America and West Africa. First introduced from Caracas to Barbados in 1847 by the Governor of the Windward Islands (Col. Reid). Seeds and roots from these Islands were transmitted to Kew by the Colonial Office in 1849—together with a "case containing some slips of this grass" from Caracas—for distribution to various Colonies, and a further supply in six Wardian cases—shipped by H. M. Consul (Mr. J. Riddel) from Caracas was received at Kew about the same time. From these plants distribution was made to various Colonies in the Eastern Hemisphere—including N.S. Wales, W. Australia, Ascension etc. The introduction of this grass is one of the earliest operations of the then Director of Kew (Sir W. Hooker) to assist industries in the Colonies (Kew Bull. *seq.*).

A fodder grass recommended for general pasture purposes as one of the best of the tropical grasses; employed in Ceylon for feeding milk cattle (Kew Bull. *seq.*).

A perennial, 3–6 ft. sometimes 8 ft. high; may be propagated by seed and division of or pieces of the rootstock or stolons and requires a hot climate with a good rainfall. In Ceylon where it is the chief fodder-grass it remains green all the year round.

The best method of propagating is to cut the long lateral stems into short lengths; broadcast these sparingly over the

surface and cover lightly with soil. When ready to cut, the grass is very thick and stands about 18 in. high; it has been found to grow slower than "Guinea Grass" (*Panicum maximum*) and does not give the same out-turn. A plot (Poona, India) when fully established, cut twice at intervals of 87 days, yielded at the first cutting 10,700 lb. and at the second cutting 18,020 lb. of green fodder per acre (Kew Bull. *seq.*, Rep. Gov. Exp. Farm, Poona, March 31st, 1894, p. 5). The grass is largely cultivated for pasturage in Brazil, where it is considered unequalled for the quantity of the feed which it produces (Vasey, Agric. Grasses, p. 35). It is regarded as one of the best fodder grasses for milch-cows in Abyssinia (Schweinfurth, Pl. Utile Eritrea, p. 53). In British Guiana, Para grass that had been reaped on the same ground for several years in succession without manure, ploughing or replanting, in five mowings in the year gave 41½ tons per acre (Kew Bull. 1897, p. 209).

Ref.—"*Panicum muticum,*" in "Tropical Fodder Grasses," Kew Bull. 1894, pp. 384–385.——"Para Grass (*Panicum barbinode*)" in Forage Plants and Their Culture, Piper, pp. 253-254 (The Macmillan Co. New York, 1915).

Axonopus, P. Beauv.

Axonopus compressus, *P. Beauv.*; Fl. Trop. Afr. IX. p. 566.

Ill.—Trinius, Sp. Gram. Ic. t. 118 (*Paspalum platycaule*); Lamson-Scribner, U.S. Dept. Agric. Agrost. Bull. No. 7, 1897 p. 42, f. 24 (*Paspalum compressum*); Teysmannia, xxiv. 1913, t. 8 (*P. platycaulon*); Agric. Gaz. N.S. Wales, xxx. Sept. 2, 1919, p. 636, f. 3 (*P. compressum*); Lyman Carrier, U.S. Dept. Agric. Farmers' Bull. No. 1030, 1920, pp. 5, 6, 11; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 224, f. 135.

Vernac. names.—Boni (Sierra Leone, *Thomas*).—Carpet Grass, Louisiana Grass.

Lagos, Brass River, Opobo, in S. Nigeria; also Sierra Leone, French Guinea, Ivory Coast, and the Belgian Congo; in Tropical America, West Indies; Southern and South-Eastern N. America, Madagascar, Mauritius, Seychelles, Singapore, Java, etc. Introduced from America to N.S. Wales.

A pasture grass in the West Indies, S. United States and N.S. Wales and in regions where it thrives as a pasture grass it may be grown as a lawn-grass (Hitchcock, l.c. p. 224).

A perennial ½–2 ft. high growing in small tufts from a slender rhizome; thrives in a tropical climate with a good rainfall, likes rich soil: but will grow on comparatively poor soils. It is the predominant pasture grass in the United States from Virginia to Florida and Texas in the lowland along the Coast, in alluvial ground; but is of little importance on sandy soil and does not thrive in the uplands (l.c.). Many of the old cotton fields in the United States are stated to be thickly set with Carpet Grass and it is said to grow better than "Bermuda Grass" (*Cynodon*

Dactylon) in sandy soils and on many alluvial soils, as in the lower Mississipi Valley it has been found to gradually crowd out Bermuda Grass. May be propagated like the Bermuda Grass (see p. 856) by division of the rhizomes or from seed sown at the rate of 10 lb. an acre (Carrier, *seq.*). It has, however, been found that there is little commercial seed on the market and the grass is propagated by scattering small pieces of sod about the ploughed field (Breakwell, *seq.*). Furnishes grazing for one cow to the acre for about 5 months each season and for one cow to 2 acres for 3–4 months longer; close grazing being essential to keeping the grass in good condition. In countries north of Florida "Japan Clover" (*Lespedeza striata*, Hook. & Arn.) is recommended as a mixture (Carrier, *seq.*) and this might be tried at the higher altitudes in Nigeria where the moisture conditions are also satisfactory, or it is suggested some other leguminous plant—"Uganda Clover" (*Trifolium Johnstoni*, Oliv.—See Kew Bull. 1899, p. 137: 1919, p. 6), for instance, in place of or in conjunction with the *Lespedeza* might be grown.

Ref.—"Carpet Grass (*Paspalum compressum*)," Breakwell, in Agric. Gazette, N.S. Wales, xxx. Sept. 2nd, 1919 ("The Paspalum Grasses") p. 634.——Carpet Grass, Lyman Carrier, U.S. Dept. Agric. Farmers' Bull. No. 1030, 1920, pp. 1–12.

Paspalum, Linn.

Paspalum conjugatum, *Berg.*; Fl. Trop. Afr. IX. p. 569.

Ill.—Palisot de Beauvois, Fl. Oware & Benin, ii. t. 92, f. 2 (*P. ciliatum*); Trinius, Sp. Gram. Ic. t. 102; Teysmannia, xxiv. 1913, t. 7.

Vernac. names.—Yane or Yani (Sierra Leone, *Thomas*).—Sour Grass (Jamaica), Crab Grass (Montserrat), Green Grass (Singapore), Hilo Grass (Hall, Hawaii, U.S. Dept. Agric., Bull. No. 48, 1904, p. 18).

Lagos, Abeokuta, Ndoni, Opobo, Old Calabar in Nigeria and widely spread in Upper and Lower Guinea; common in the hotter parts of America from the Gulf States southwards and found also in the Indo-Malayan region and Polynesia.

A good fodder grass for cattle and horses, valued in Ceylon, Singapore, Jamaica—where "it forms the excellent 'low-bite' pastures in the warmer parts of the island" (Kew Bull. 1894, p. 386); "makes excellent cattle-food" in Borneo (Beccari, Wand. Gt. Forests, Borneo, p. 192); but on the other hand it has been stated that "some of the wild grasses, notably 'carabo' or bitter grass (*Paspalum conjugatum*) are usually refused by the horses (Piper, "Notes on Forage Plants in Java and India"; Phillipine Agric. Rev. 1912, p. 428).

This grass was used by the writer for making lawns at Old Calabar (1898); plants were collected from the road-sides—where the native cattle had kept them low by grazing—during

the rainy season (July) and put in at a few inches apart. It quickly spread over the surface and after rolling and mowing presented a very fair appearance. It had the advantage over "Bermuda Grass" (*Cynodon Dactylon*) of keeping fresh and green during the dry season; but the coarser appearance of the broader blades might be regarded as somewhat of a disadvantage. "Crab Grass" has been planted in Montserrat as a lawn-grass (Ann. Rep. Bot. St. Montserrat, 1911–12, p. 1).

A perennial, 1–2 ft. high, may be propagated by seed, cuttings and transplanting of roots.

The freedom with which propagation is effected—both by the shedding of seed, rooting at the nodes, and the spread of the roots—is further indicated by the fact that in Hawaii "many thousands of acres of forest land, despoiled by cattle have been over-run by rank-growing grasses, prohibitive of forest reproduction—the worst being "Hilo Grass" (*Paspalum conjugatum* which grows 2–3 ft. high in the rainy districts and forms a dense mat several inches thick over the surface of the ground, so that tree seeds cannot germinate beneath it" (Hall, U.S. Dept. Agric. Bureau of Forestry, Bull. No. 48, 1904, p. 18); "it spreads rapidly and covers the ground to the exclusion of everything else" (Kew Bull. 1894, p. 386).

Ref.—"*Paspalum conjugatum* "(Javaansche Voedergrassen")," Backer, in Teysmannia, xxiv. 1913, pp. 366–371.

Paspalum dilatatum, *Poir*. Encyc. V. (1804) p. 35.

A perennial, 2–4 ft. sometimes 6 ft. in height.

Ill.—Ann. Rep. (2nd) Sec. Agric. Victoria, t. 27; Vasey Agric. Grasses, U.S. States (ed. 1, 1884) t. 2; Journ. Dept. Agric. W. Australia, ii. July 1900, p. 2; Transvaal Agric. Journ. i. April 1903, p. 40; ii. 1903–04, t. 68; Journ. Dept. Agric. W. Australia xiv. Aug. 1906, p. 126; Journ. Dept. Agric. S. Australia, x. Feb. 1907, p. 417; Transvaal Agric. Journ. viii. Oct. 1909, p. 71, t. 17 ("Paspalum or Breed-zaad"); Teysmannia, xxiv. 1913, t. 4; Bull. Agric. Congo Belge, v. Dec. 1914, p. 665; Agric. Gaz. N.S. Wales, xxx. Sept. 1919, p. 633, f. 1.

Hairy-flowered Paspalum, Large Water Grass, Leichardt Grass (Victoria), Golden Crown Grass; Breed-zaad (Transvaal).

Indigenous to Brazil, Argentine, Uruguay; distributed to the Gulf States and Florida; introduced to N. Zealand, Australia, India, B.E. Africa (Kenya Colony), Natal, found also in Porto Rico, Mauritius and Straits Settlements; cultivated experimentally in the Gold Coast Colony, and the West Indies.

An excellent hay and pasture grass, strongly recommended for Tropical and Sub-tropical climates. The analysis is said to compare very favourably with that of ordinary English hay, and shows a larger proportion of digestible and nourishing material: Moisture, 10·55; Albuminoids, 10·31; Digestible Fibre, 29·96; Woody Fibre, 27·95; Ash, 6·37; Amide compounds, chlorophyll, etc. 14·86 per cent. (Guthrie, N.S. Wales Agric. Gaz. 1897: Kew Bull. 1902, p. 3).

May be propagated by seeds or by division of the roots—5–8 lb. of seed per acre (Agric. Gaz. N.S. Wales, 1897: Kew Bull. 1902, p. 3)—or at least, 10–12 lb. of good hand-shaken seed are required per acre which may lie in the ground some considerable time before germinating (Breakwell, Agric. Gaz. N.S. Wales, Sept. 2nd, 1919, p. 632), or roots planted 4–5 ft. apart; and other suitable grass or leguminous fodders are sometimes grown as a mixture for permanent pastures. The plant thrives best in rich moist land, soils of volcanic origin and black alluvial soils, but it is also said to succeed on sandy or comparatively poorer soils with a good rainfall in all cases and when once established, being a deep-rooted plant, it stands drought more or less; but in this respect it is considered not so good as "Rhodes Grass" (*Chloris Gayana*) (Breakwell, l.c. p. 634), and again it has been stated that in a dry time, when perennial rye," "prairie," and "cocksfoot" were dried up, one cow to the acre run in a paddock of "Paspalum" has kept in good condition and given a fair quantity of milk (Heron, Transvaal Agric. Journ. April 1903, p. 40). It is advisable to encourage shedding of seed until growth is established, and under favourable conditions the seed germinates in from 18–21 days. In good soil and when well established it has been found (Richmond River, N.S. Wales) that three crops may be obtained per annum, giving 14 tons at the first cutting, 8–10 tons the second and 6–7 tons the third or a total of 28–31 tons per acre. The yield of grass for one crop (Queensland) was 10·5 tons per acre and of hay (air-dried grass), 2·8 tons per acre (Kew Bull. 1902, p. 3). Cutting should be done before flowering, it is reported that Paspalum is not appreciated by stock at the flowering stage (Breakwell, l.c. p. 632). A plot of this grass was found to grow well on the Gold Coast at Tamale (Saunders, Rep. Agric. Dept. Gold Coast 1911 (for 1910) p. 38), and it has been recommended for growing amongst Rubber (*Hevea*) trees as a cover crop and for feeding cattle (India Rubber World, April 1st, 1914, p. 347).

Ref.—*Paspalum dilatatum*: A New Fodder Grass for India, Watt, in Agric. Ledger (Calcutta) No. 1, 1901, pp. 1–9.——"*Paspalum dilatatum*: An American Fodder Grass," Kew Bull. 1902, pp. 1–4; reprinted as No. 27, April 1907, Dept. of Agric. Nairobi.——"Large Water Grass (Breedzaad): *Paspalum dilatatum*," Heron, in Transvaal Agric. Journ. i. April 1903, pp. 40–41.——"Paspalum Grass," Harrison, in Journ. Agric. W. Australia, xiv. Aug. 1906, pp. 126–129 and in Natal Agric. Journ. x. March 1907, pp. 227–230.——"*Paspalum dilatatum*, Golden Crown Grass," Journ. Agric. S. Australia, x. Feb. 1st, 1907, p. 416.——"*Paspalum dilatatum*" ("De la Nécessité d'améliorer les Paturages Naturels et le Bétail du Congo"), Leplae, in Bull. Agric. Congo Belge, v. Dec. 1914, p. 665.——"*Paspalum dilatatum*" ("The Paspalum Grasses"), Breakwell, in Agric. Gaz. N.S. Wales, xxx. Sept. 2nd 1919, pp. 632–634.

Paspalum scrobiculatum, *Linn.* var. **Commersonii,** *Stapf*; Fl. Trop. Afr. IX. p. 573.

Ill.—Lam. Encycl. t. 43, f. 1 (*P. Commersonii*); Palisot de Beauvois, Fl. Oware & Benin, ii. t. 85, f. 1 (*P. Kora*); Wildenow, Hort. Berol. t. 74 (*P. Kora*); Duthie, Indig. Fodder Gr. N. India, t. 21 (*P. Kora*); Wood, Natal Pl. ii. t. 134.

Vernac. names.—Tumbin Jaki (Hausa, *Dalziel*); Ikbonta (S. Nigeria, *Thomas*).

Lagos, Nupe, Etoi River, Opobo, Abinsi etc. in Nigeria and widely spread in Tropical Africa and throughout the Tropics of the Old World.

A good feed for cattle and sheep, M'rewa, Rhodesia (Appleton, No. 25, Herb. Kew); but said to be unwholesome to donkeys if fed on it too long, Yola (Dalziel, Kew Bull. 1910, p. 142); a wild grass used in some districts as a cereal, a sort of "Hungry Rice" or "Bastard Millet"—unwholesome effects observed, Hausaland (Dalziel, Hausa Bot. Voc. p. 97); may not infrequently be seen being ground like cultivated grain in riverside markets of the Bashima and Batta tribes on the Benue (Dalziel, Kew Bull. l.c.).

A perennial 1–2 ft. high or more (Fl. Trop. Afr. l.c.).

Paspalum scrobiculatum, *Linn.* var. **polystachyum,** *Stapf*; Fl. Trop. Afr. IX. p. 576.

Ill.—Trinius, Sp. Gram. Ic. t. 125 (*P. firmum*).

Opobo, Nun (Niger) River, Idu (New Calabar), Onitsha, Lokoja, Burutu, Nupe, Abinsi in Nigeria.

Culms 4 ft. or so high.

The cultivated forms of *Paspalum scrobiculatum*, Linn. (*P. s.* var. *frumentaceum*, Stapf) usually described as annuals or grown as annual plants (Watt, Church, Duthie; Kew Bull. *seq.*) the "Ditch Millet" (of N.S. Wales) or "Kodo Millet" of India, is commonly recommended in India (Duthie) and the East for pasture and for hay—cattle and especially buffaloes eat the grass readily when it is young (Kew Bull. 1894, p. 386)—but said to be more or less poisonous to animals at the time of ripening. The grain largely used as food in India is also at times very unwholesome "Kodra" poisoning frequently occurring (l.c.). *P. scrobiculatum* is also said to constitute the only pasture in the Sende district in the Belgian Congo (Fl. Trop. Afr. l.c. p. 576) and it is probable that all the forms of this variable species might be used as fodder.

Paspalum vaginatum, *Sw.*; Fl. Trop. Afr. IX. p. 570.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 80 (*P. distichum*); Palisot de Beauvois, Fl. Oware & Benin, ii. t. 85, f. 2 (*P. longiflorum*); Trinius, Sp. Gram. Ic. t. 112 (*P. littorale*); t. 120; Teysmannia, xxiv. 1913, t. 9 (*P. distichum*).

Nun (Niger) River (Vogel), Cameroons, Senegal, Fernando Po, Somaliland, Uganda, Gaboon, Angola, Mozambique District, throughout the Tropics and also found in Southern Spain.

A good grazing grass, Somaliland (Appleton, Herb. Kew).

A perennial, 1½–2 ft. high; base creeping 6–8 in. high, Somaliland (Appleton, l.c.); turf forming grass on damp ground in marsh (saline), South Angola (Pearson, No. 2166, 1909, Herb. Kew); found on the sandy shores of the Nun (Vogel, Herb. Kew), creeping on the beach, Fernando Po (Mann, Herb. Kew), in crevices of rocks on the shore, Batanga (Bates, Herb. Kew) and in general mostly on the sea-shore (Fl. Trop. Afr. l.c. p. 571).

Ref.—"*Paspalum distichum* ("Javaansche Voedergrassen")," Becker, in Teysmannia, xxiv. 1913, pp. 423–428.

Stenotaphrum, Trin.

Stenotaphrum secundatum, *O. Kuntze*; Fl. Trop. Afr. IX. p. 579 [*S. glabrum*, Trin. Fund. p. 176; *S. americanum*, Schrank, Plant. Rar. Hort. Monac. t. 98, f. 8].

Ill.—Lam. Encycl. t. 48, f. 1*b* (*Rottboella tripsacoides*); Palisot de Beauvois, Fl. Oware & Benin, t. 21, f. 8 (*R. compressa*); Martius, Fl. Bras. ii. pt. 2, t. 39 (*S. glabrum*); Vasey, Grasses, U.S. Dept. Agric. Bot. Bull. No. 12, part 1, 1890, t. 8; Year Book, U.S. Dept. Agric. 1894, p. 426, f. 104 (*S. americanum*); Kearney, U.S. Dept. Agric. Agrost. Bull. No. 1, 1895 (*S. americanum*); Wood, Natal Pl. ii. t. 184 (*S. glabrum*); Hitchcock, Grasses (1914), p. 188, f. 28 (*S. secundatum*) and U.S. Dept. Agric. Bull. No. 772, 1920, p. 220.

St. Augustine Grass (America), Mission Grass (Florida, *Kearney*), Pimento Grass (Jamaica, *Cousins*), Crab Grass (Bermuda, *Middleton*—spec. in Herb. Kew), Mat Grass (St. Helena, *Melliss*—spec. in Herb. Kew), English Wire Grass (St. Helena, *Burchell*—spec. in Herb. Kew), Buffalo Grass (Australia); Herbe bourrique (Mauritius, *Tempany*); Cape Tweek Grass, Natal Tweek Grass (*Burtt-Davy*).

Opobo (Jeffreys, No. 18, Herb. Kew), Nun (Niger) River (Mann), Cameroons and also known from the Ivory Coast, Gold Coast, St. Thomas Island, Prince's Island, Gaboon, Angola, St. Helena, S. Africa, Tropical America, Australia etc. Introduced to South of France and Italy (Fl. Trop. Afr. l.c.).

A pasture grass—"a tender succulent grass, in good soil making a considerable quantity of forage and is said to be excellent for sheep pastures" (Kearney, U.S. Dept. Agric. Agrost. Bull. No. 1, 1895, p. 18); affords nourishing food for animals pastured under the "Pimento" trees in Jamaica; but opinions vary as to the merits as a fodder plant in other countries (Kew Bull. 1894, p. 387). Cattle are regularly pastured on this grass established under the shade of Casuarina woods in Mauritius (Tempany, Agric. News, Barbados, Feb. 22nd 1919, p. 51).

Used for lawns—it forms a pretty green soft mat or velvety-looking turf, St. Helena (Melliss, Herb. Kew); grown as a lawn grass near the sea-coast from North Carolina to Florida and Louisiana (Hitchcock, Text-book Grasses, p. 188); used for making lawns, S.E. United States, planted along the streets in

Savannah—"it makes a dense turf when kept closely cut, has a fresh green colour when growing in good soil, is as well adapted to resist drought as Bermuda and certainly makes a brighter prettier lawn than that grass does," which it is said to drive out as well as all other grasses, although easily eradicated itself by ploughing under (Kearney, l.c.); for lawns in Natal (Wood, Natal Pl. ii. t. 184) and for lawns in Durban and Melbourne (Victoria) but rather coarse for the purpose (Burtt-Davy, Transv. Agric. Journ. iii. Jan. 1905, p. 289); recommended for binding sea sand and loose soil of river banks (Kew Bull. l.c.).

A perennial, 1 ft. or so high, creeping with wide spreading rhizomes—by cutting up which it may be readily propagated in the same way as for "Bermuda" Grass (*Cynodon Dactylon*). It flourishes on dry lime-stone soils in Jamaica, on the arid volcanic rocks of the island of Ascension and keeps alive in the hottest and driest region of Central Australia (Kew Bull. l.c.), grows abundantly in damp places, St. Helena (Melliss, l.c.) and running far and rooting at the joints, often forming the principal part of the beach-tangle, Batanga (Bates, Herb. Kew); thrives luxuriantly under the shade of trees of *Casuarina equisetifolia*, planted when the trees are from 4–5 years old, Mauritius (Tempany, l.c.).

Ref.—"Pimento Grass: *Stenotaphrum americanum*" (Jamaica Fodders"), Cousins, in Bull. Dept. Agric. Jamaica, i. Nov. 1903, pp. 244–245—with analysis.——"Mission Grass, (*Stenotaphrum glabrum*)" Burtt-Davy, Transv. Agric. Journ. iii. Jan. 1905, p. 289—with analysis.

PASPALIDIUM, Stapf.

Paspalidium geminatum, *Stapf*; Fl. Trop. Afr. IX. p. 583 [*Panicum fluitans*, Retz].

Vernac. name.—Hakorin Kare (Hausa, *Dalziel*).

Sokoto, Bornu, French Sudan, Gold Coast, Cape Verde Islands, Nile Land, Lower Guinea, Tanganyika Territory (G.E. Africa), Nyasaland, Portuguese East Africa, etc.

Used as fodder, Sokoto (Dalziel, Hausa Bot. Voc. p. 46).

Perennial with long creeping or floating stolons, abundant in small streams, Sokoto (Dalziel, l.c.), on the shore of Lake Chad (Elliott, Herb. Kew), found on dunes and in marshes near Timbuctu (Chevalier, Herb. Kew) and in rice fields near Amboni, Usambara (Holst, Herb. Kew).

UROCHLOA, Beauv.

Urochloa insculpta, *Stapf*; Fl. Trop. Afr. IX. p. 599 [*Panicum insculptum*, Steud. Syn. Pl. Glum. i. p. 49].

Lagos, Nupe, Katagum, Sokoto, in Nigeria; known from French Guinea, French Sudan, Dahomey, Gold Coast, Central Shari region, Eritrea, Abyssinia, Sudan, and Tropical Arabia.

A good fodder, Arabia (Schweinfurth, Herb. Kew).

An annual 4–5 ft. high; common in shady ravines, Nupe (Barter, Herb. Kew); in fields, Sokoto (Dalziel, Herb. Kew).

ECHINOCHLOA, Beauv.

Echinochloa colona, *Link*; Fl. Trop. Afr. IX. p. 607 [*Panicum colonum*, Linn. Sp. Pl. p. 84].

Ill.—Jacq. Eclogae Pl. Rar. (Gram.) i. t. 32 (*Panicum colonum*); Trinius, Sp. Gram. Ic. t. 160 (*P. colonum*); Duthie, Indig. Fodder Gr. N. India, t. 4 (*Panicum colonum*); Church, Food Grains, India, p. 51 (*P. colonum*); Lisboa, Bombay Grasses, p. 11 (*P. colonum*).

Shama Millet (India); Wild or Jungle Rice (India, *Church*).

Nupe in Northern Nigeria, Senegambia, French Sudan, Nile Land, including Somaliland, Uganda, B.E. Africa (Kenya Colony) in Angola, French Congo, G.E. Africa (Tanganyika Territory), Nyasaland, Rhodesia etc. and widely spread in the Tropics and many warm countries.

A fodder plant—"generally considered one of the best fodder grasses in India; it is greedily eaten by all kinds of cattle, both before and after it has flowered, the abundant crop of grain which it yields adding materially to its nutritive value" (Watt, Dict. Econ. Prod. India). The grain is also sometimes used for food by the poorer people in India (l.c. and Church, "Food-grains of India," p. 50).

An annual, growing in small tufts up to 2 ft. high (Fl. Trop. Afr. l.c.); prefers a rich soil and is often met with as a weed of cultivation, abundant throughout the plains, India (Watt l.c.).

Echinochloa Crus-Pavonis, *Schult.*; Fl. Trop. Afr. IX. p. 612 [*Panicum Crus-Pavonis*, Nees: *Oplismenus Crus-Pavonis*, H.B. & K.].

Ill.—Wood, Natal Pl. ii. t. 151 (*Panicum Crus-Pavonis*, var. *rostratum*).

Vernac. name.—Yofoni (Sierra Leone, *Thomas*).

Lagos, Oban in Nigeria, Sierra Leone, French Guinea, Uganda, Belgian Congo, Angola, Nyasaland and also in Natal and Tropical South America.

An annual, 5 ft. high; suggested as a fodder plant.

Echinochloa pyramidalis, *Hitchcock & Chase*; Fl. Trop. Afr. IX. p. 615 [*Panicum pyramidale*, Lam.; *Panicum frumentaceum* Benth. (non Roxb.)].

Ill.—Kunth, Rev. Gram. i. t. 23 (*Panicum pyramidale*).

Vernac. names.—Roba (Hausa, *Dalziel*); Aloa (Shuwa Arabs, Lake Chad, *Lamb*); Om Suf (Arabic, *Muriel*); Kreb, Kasha (Bornu, *Chevalier, Stapf*); Lingui (French Sudan, *Chevalier, Stapf*).

Lagos, Katagum, Sokoto, Nupe, Bornu in Nigeria and widely distributed in Tropical Africa.

An excellent fodder grass, much relished by animals, French Sudan (Lécard, Herb. Kew: Fl. Trop. Afr. l.c. p. 617) and Lake Chad (Lamb, Herb. Kew); the grain is used for food in Bornu (Chevalier, l.c.) and "an impure salt or carbonate of soda is made by burning this grass, used for culinary purposes when salt is not to be procured, in Nupe (Barter, Herb. Kew).

A perennial, up to 15 ft. high; growing in the water, often cultivated, Abo-Niger (Vogel, Herb. Kew: Hooker, Niger Flora, p. 561—*Panicum frumentaceum*); a river grass 10 ft., White Nile (Muriel, Herb. Kew); a reed 3–4 ft. Nairobi River, alt. 3500 ft. (Battiscombe, Herb. Kew), growing wild in the river Libet, Lake Chad (Lamb, No. 108, 1921, Herb. Kew).

Echinochloa stagnina, *Beauv.*; Fl. Trop. Afr. IX. p. 617· [*Panicum stagninum*, Retz.; *Oplismenus stagninus*, Kunth.]

Ill.—Wood, Natal Pl. v. t. 492 (*Panicum stagninum*); Chevalier, Compt. Rendus, Assoc. Franc. Paris, 1900, t. 5 (*Panicum Burgu*); Act. Congrés Internat. Paris, 1900, t. 10 (*P. Burgu*); Une Nouv. Pl. à Sucre [Reprint], p. 646 & t. 5 (*Panicum Burgu*).

Vernac. names.—Borgou, Birgou, or Burgu (Middle Niger, *Chevalier, Stapf*); Burugu (Hausa, *Dalziel*); Aloa (Shuwa Arabs, Lake Chad, *Lamb*).

Nupe, Katagum, Sokoto, Lake Chad; also widely distributed in Upper and Lower Guinea, Nile Land and Mozambique District.

A good fodder and the soft juicy stems are sucked or made into sugar water, Sokoto (Dalziel, Herb. Kew: Hausa Bot. Voc. p. 17); a fodder grass, much relished by stock, Lake Chad (Lamb, Herb. Kew); an excellent fodder plant, the grain is a food, the plant furnishes material for thatching and caulking, is burned to produce a salt in the manufacture of soap and indigo and the canes are gathered for extracting sugar or making a beverage like cider, and in fact every part of the plant seems to find a use in the Middle Niger region where in the neighbourhood of Timbuctu of all the plants found wild, it is considered the most useful (Chevalier, *seq.*; Stapf, Fl. Trop. Afr. l.c. p. 619); one of the richest of fodder plants, Zambesi Delta (Kirk, Herb Kew; Stapf, l.c.).

A perennial, up to 6 ft. high and together with *E. pyramidalis* the chief constituent of the extensive water meadows, inundated by the Niger and Lake Chad, in the Sudd areas of the Nile and in other rivers. Very abundant westward of Sokoto to the Niger and beyond, the luxuriant growth blocking streams and waterways, and in marshes in Katagum (Dalziel, l.c.); rooted in mud in deep water in marshes, South Angola (Pearson, Herb. Kew); in swamps and lakes, Nupe (Barter, Herb. Kew), growing wild in the River Libet at south end of Lake Chad (Lamb, No. 108, 1921, Herb. Kew).

Ref.—"Une Nouvelle Plante à Sucre de l'Afrique Française Centrale," Chevalier, in Revue Cult. Col. vii. Sept. 1900, pp. 513–520.——"Une Nouvelle Plante à Sucre de l'Afrique Française Centrale (*Panicum Burgu*, Chev.)," Chevalier, in Extrait des Comptes rendus de l'Assoc. Franc. 1900, pp. 642–656.

Oplismenus, Beauv.

Oplismenus Burmannii, *Beauv.*; Fl. Trop. Afr. IX. p. 636.

Ill.—Host, Gram. Austr. iii. t. 52 (*Panicum hirtellum*); Trinius, Sp. Gram. Ic. t. 193; Duthie, Indig. Fodder Gr. N. India, t. 47.

Lagos, Ndoni Town (Barter)—on the Engenni River, a tributary of the Niger; Cameroons, Senegambia, Sierra Leone, French Guinea, Lower Guinea, Abyssinia, Lake Nyasa etc. in Tropical Africa and widely distributed throughout the Tropics.

Cattle eat this grass when young and it is said to make good hay, India (Watt, Dict. Econ. Prod. India).

An annual, 1½ ft. high, culms slender, found under various conditions—in open woods and swampy places, Fernando Po (Vogel, Herb. Kew), in grassy wooded places, in maize fields and in shady woods, Angola (Welwitsch, Herb. Kew).

Oplismenus hirtellus, *Beauv.*; Fl. Trop. Afr. IX. p. 631. [*O. africanus*, Beauv. Fl. Oware ii. p. 15; *Panicum africanum* Poir. Encycl. Suppl. iv. p. 275.]

Ill.—Pal. de Beauv. Fl. Oware & Benin, ii. t. 68, f. 1; Beauvois, Agrost. t. 11, f. 3; Trinius, Sp. Gram. Ic. t. 188 (*Panicum compositum*); Martius, Fl. Bras. ii. pt. 2, t. 23 (*P. loliaceum*).

Vernac. name.—Sumffigi (Sierra Leone, *Thomas*).

Lagos, Oware, Benin, Kabba Road, Oban in Nigeria, Cameroons Sierra Leone, Gold Coast, Liberia and widely distributed in Tropical Africa, including Lower Guinea, Nile Land—Kenya Colony, Uganda, etc., and Mozambique District.

A fodder grass, collected for horses, Entebbe, Uganda (Mahon, Herb. Kew).

A perennial, up to 8 ft. (Mann, Herb. Kew) with slender-culms in rich humid places, often on Lake Shore, Entebbe (Mahon, l.c.), in shady situations, not common, Kabba (Parsons, Herb. Kew), in shady places in the Ikoyi bush, Lagos (Dalziel, Herb. Kew), a common low grass in forest, Chipete, Rhodesia, altitude 3500 ft. (Swynnerton, Herb. Kew).

Panicum, Linn.

Panicum anabaptistum, *Steud.*; Fl. Trop. Afr. IX. p. 678 [*Panicum subalbidum*, Cheval. Sudania, pp. 34, 176.]

Vernac. names.—Tsuntsia or Tsintsiya (Katagum, *Dalziel*).

Nupe, Katagum, Sokoto in Nigeria and also known from the Cameroons, Senegambia, French Sudan and Chari Territory.

Used for thatch, making mats, brooms, etc. Katagum and Sokoto (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 96); a fodder plant, French Guinea (Pobeguin, Fl. Guin. Franç. p. 214).

A perennial, 3–4 ft. high, much planted as a field boundary in Sokoto (Dalziel, l.c.—*P. subalbidulum*); 5 ft. in moist places, Nupe (Barter, Herb. Kew).

Panicum Dregeanum, *Nees*; Fl. Trop. Afr. IX. p. 684.

Abinsi, N. Nigeria, Congo, Rhodesia, Nyasaland and widely distributed in Tropical Africa, also in the Transvaal and Natal.

A good forage plant in Rhodesia (Appleton, Herb. Kew).

A perennial, 1–4 ft. high, with erect very slender stems; common in damp pastures, near Abinsi (Dalziel, Herb. Kew); found growing in clumps near water, M'rewa, Rhodesia (Appleton, l.c.).

Panicum laetum, *Kunth*; Fl. Trop. Afr. IX. p. 700. [*P. subalbidum*, Hochst. (non *Kunth*).]

Vernac. names.—[Baia or Baya (Katagum); Baina (Kano); Sabe or Sabi (Hausa), *Dalziel*]; Kandala, Karkiebon, Saba fatan (French Sudan, Baghirmi, *Chevalier*).

Katagum, East Hausaland, in N. Nigeria and Middle Niger region, French Sudan.

An important food grain in time of scarcity, Katagum (Dalziel, No. 262, Herb. Kew); but the grain is recorded by Chevalier (No. 9934, Herb. Kew) as not being eaten in Bagirmi, River Shari region.

Annual, 1–2 ft. high, more or less tufted (Stapf, Fl. Trop. Afr. l.c.) a wild grass common in East Hausa (Dalziel, Hausa Bot. Voc. p. 15), edible grain gathered by sweeping a calabash across the heads—and the name " Sabi " for this reason perhaps applied to more than one species (l.c.—*Panicum albidulum*).

Panicum longijubatum, *Stapf*; Fl. Trop. Afr. IX. p. 718. [*Panicum proliferum*, Lam. var. *longijubatum*, Stapf, Fl. Cap. vii. p. 406; *P. miliare*, Chev. Sudania, p. 159.]

Vernac. names.—Machara, Gabara (Hausa, *Dalziel*).

Katagum, Sokoto, also known from parts including almost the whole of West Africa, Somaliland, Eritrea, Belgian Congo, East Africa and in South Africa.

Hollow stems used as whistles by children in Katagum (Dalziel, l.c. p. 71); a fodder plant, French Guinea (Pobeguin, l.c.)

Perennial, 4 ft. or so high.

Panicum maximum, *Jacq.*; Fl. Trop. Afr. IX. p. 655.

Ill.—Jacq. Ic. Pl. Rar. i. t. 13; Wood, Natal Pl. ii. t. 156; Bull. Agric. Congo Belge, v. p. 664, f. 219; Teysmannia, xxv. 1914, p. 524, t. 26; Philippine Agric. Rev. May 1914, t. 2; Agric. Gaz. N.S. Wales, xxix. 1918, p. 845, f. 2.

Vernac. names.—Ikbo mili (Ala, S. Nigeria, *Thomas*); Capim de Angola (Brazil, *Stapf*); Capim de Colonia (Brazil, Kew Bull.

1894, p. 382).—Guinea Grass, Bengal Grass (Java, *Backer*); Fataque Grass (Seychelles, *Jourdain*).

Lagos, Engenni River, Idu, Nupe, Opobo, Lokoja, Abo (Niger), Abinsi, etc. in Nigeria and known also from Senegambia, Sierra Leone, Gold Coast, Dahomey and Cameroons in other parts of Upper Guinea, in Lower Guinea, Somaliland, Nile, Congo and Zambesi regions and in general widely spread in Tropical Africa, where it is indigenous, extending to South Africa and cultivated in many tropical countries including India, Brazil, Cuba, Jamaica and other parts of the West Indies, the Gulf Coast States, Florida, Java, Philippine Islands, etc.

One of the best fodder grasses in the Tropics, suitable for all kinds of stock, recommended as a soiling crop and cut before the stems get hard and woody may be used as hay and silage.

A perennial, 3–6 ft., sometimes over 10 ft. high, propagates freely from seeds; but commonly grown by division of the roots, planted about 2 ft. or more apart; requires a fairly rich well drained soil, a hot climate with a good rainfall or with every facility for irrigation, it grows quickly and comes to maturity in 3 months or so and under good conditions lasts for a good number of years. In India it has been found to yield in 45 days a cutting 6–8 ft. high weighing 14 tons on the average, per acre (Dict. Econ. Prod. India); and at the Hyderabad Fodder Farm—in a sandy or gravelly loam, irrigated by sugar tank water, the cuttings for the first 6 years were 1st year (1st Feb. to Nov.) 4 tons of grass per acre; and for the 2–6 years, 7 cuttings each year of 25, 50, 65, 80, and 100 tons per acre respectively, while the plots when 16 years old showed no interspaces between the tussocks and no signs of deterioration (Rao, Agric. Journ. India, 1910, p. 364). A yield of about 115 tons per hectare for the entire year has been obtained in the Philippines, where the grass has been found to improve by the application of sulphate of ammonia and Japanese tankage in equal parts at the rate of 500 kilos per hectare, or by "chemical sugar fertilizer" applied at the same rate (Philippine Agric. Rev. 1912, p. 25). In Jamaica, the grass is recorded as having been introduced (about 1740) from the Coast of Guinea as bird-food and that in 1794 "most of the grazing and breeding pens were originally created and are still supported by means of this invaluable herbage" (Kew Bull. 1894, p. 382). American military horses fed with this grass have been found to require 126 tons to feed 615 horses for a month, work and saddle horses have been kept in excellent condition with it as green feed in place of hay, while in Hawaii although not recommended there as a pasture grass, 16 acres of "Guinea grass" and 4 acres of "Para Grass" (*Panicum muticum*, Forsk.) have been found to carry 40 head of mules and horses for a year (Breakwell, Agric. Gaz. N.S. Wales, 1918, p. 843). Other instances might be quoted of the popularity of this grass in the many countries to which it has been

introduced; but it will be clear that Nigeria has here a valuable fodder plant well worthy of development, especially in the Southern Provinces, where the rainfall is more satisfactory and the general requirements more suitable.

The large and continuous supply of green forage provided, more or less the whole year round may be a sufficient recommendation; but care against over-feeding with this grass in a rank state has been advised (Kew Bull. l.c. p. 383) and used as hay the moisture content is very heavy; the loss in weight by air-drying, proved by actual experiment in Trinidad, has been found to be at the rate of 63 lb. per 100 lb., allowing a further 33 per cent. for unedible portions, a return of 75 tons was reduced to 18·6 tons of air dry Guinea Grass per acre per annum (Hart, Ann. Rep. Roy. Bot. Gdn. Trinidad, 1898, p. 14).

Ref.—"*Panicum jumentorum*, Guinea Grass," Watt, Dict. Econ. Prod. India, v. part 1A, 1892, pp. 10–12.——"*Panicum maximum*," in Kew Bull. 1894, pp. 382–383.——Food Value and Yield of Guinea Grass (*Panicum maximum*)," Annual Rep. Roy. Bot. Gdns. Trinidad, 1898, pp. 14–15.——"L'Herbe de Guinée ou *Panicum maximum*," in Pl. Utile Congo, De Wildeman, Art. x. pp. 63–68; xxxi. pp. 504–506 (Spineux et Cie, Bruxelles, 1903–04).——"Guinea Grass," in "Some Important Grasses and Forage Plants for the Gulf Coast Region," Tracy, U.S. Dept. Agric. Farmers' Bull. No. 300, 1907, pp. 11–13.——"Cultivation of Guinea Grass," Narayan Rao, in Agric. Journ. India, v. Oct. 1910, pp. 362–366.——"Guinea Grass (*Panicum maximum*)," Jacobson, in Philippine Agric. Rev. vii. May 1914, pp. 211–215.——"*Panicum maximum*, var. *communis*, Backer, in Teysmannia, xxv. 1914, (Javaansche Voedergrassen") pp. 523–549——"Guinea Grass (*Panicum maximum*)" Piper, in Forage Plants and Their Culture," pp. 254–256 (The Macmillan Co. New York, 1915).

Panicum miliaceum, *Linn.*; Fl. Trop. Afr. IX p 696.

Ill.—Host. Gram. Austr. ii. t. 20; Jacq. Eclogae. Gram. t. 31 (*P. asperrimum*); Trinius, Sp. Gram. Ic. t. 221; Hitchcock, Grasses, p. 182, f. 21; Duthie, Field Crops, t. 23; Barber, Inter. Sugar Journ. Dec. 1920, p. 685.

Vernac. names.—Chena (India, *Watt*); Brown Corn Millet (from the resemblance of the heads to those of "Broom Corn"—*Sorghum*), Indian Millet, Proso Millet (Russia, *Walters*).

Nyasaland, etc. in East Tropical Africa, cultivated but more commonly grown in India, Ceylon, China, Japan, Persia, Egypt, Russia, America, etc.

Grain used as food, largely for cage-birds, and the plant more or less for forage.

An annual plant, 2–4 ft. high, very variable—seeds white, red, brown, black or shades approaching these colours, the varieties including "French White," "Red Orenburg and "Black Voronezh" (Russian), and "Early Fortune" (seeds reddish-brown) and "Brown Millet"; the yield has been given

(in America) at 50 bushels or 2500 lb. per acre (Walters, Agric. Journ. Union S. Africa, 1911, p. 187).

Ref.—Proso or Hog Millet, Martin, U.S. Dept. Agric. Farmers' Bull. No. 1162, 1920, pp. 1–15, illustrated.

Panicum repens, *Linn.*; Fl. Trop. Afr. IX. p. 708.

Ill.—Cav. Ic. ii. t. 110; Sibth. Fl. Gr. t. 61; Teysmannia, xxviii. 1917, p. 273, t. 38; Barbey, Herbor. Levant, t. 8, f. 4 (*P. leiogonum*).

Vernac. name.—Roempoet-lalampoejangan (Java, *Backer*); Attora (Ceylon, *Thwaites*).

Lagos, Nupe, Cameroons, Sierra Leone, Sudan, Uganda, French Congo, Belgian Congo, Angola, Rhodesia, in Africa and widely distributed in Tropical and Sub-tropical countries, including the Mediterranean region, India, China and Malaya (Kew Bull. 1907, p. 214).

Said to be a very good fodder-plant and also useful as a sand-binder (Fl. Trop. Afr. l.c.); a fodder plant in Java (Backer, Teysmannia, 1917, *seq.*), in India and Ceylon (Watt, Dict. Econ. Prod. India); a good fodder for cattle, but a troublesome weed in gardens, Ceylon (Thwaites, Pl. Zeyl. p. 360).

A perennial 2 ft. or so high with creeping rhizomes; found near water, Lagos (Dawodu, Herb. Kew), in wet places, Nupe (Barter, Herb. Kew), in sandy flats near the beach, Cameroons (Bates, Herb. Kew).

Ref.—"*Panicum repens,*" Backer, in Teysmannia, xxviii. 1917 ("Javannsche Voedergrassen"), pp. 273–284.

SACCIOLEPIS, Nash.

Sacciolepis interrupta, *Stapf*; Fl. Trop. Afr. IX. p. 757. [*Panicum interruptum*, Willd. Sp. Pl. i. p. 341.]

Ill.—Griffiths, Ic. Pl. Asiatic, t. 139 f. 221; t. 146 f. 2.

Vernac. names.—Bubuchi (Sokoto, *Dalziel*); Koep, or Be, Kuli, Elube, Nombo (Sierra Leone, *Thomas*).

Lagos, Opobo, Sokoto in Nigeria and known also from Sierra Leone, Uganda, Belgian Congo, Angola, Nyasaland; in India, China, and Malaya.

A perennial 2–5 ft. high, in marshes and rivers, Sokoto (Dalziel, Herb. Kew and Hausa Bot. Voc. p. 16—*Panicum interruptum*); in swamps, India (Fl. Br. India, vii. p. 41); suggested for planting as a mud-binder.

SETARIA, P. Beauv.

Setaria aurea, *Hochst.*; Fl. Trop. Afr. IX. ined.

Ill.—Wood, Natal Pl. v. t. 479; Transv. Agric. Journ. vi. 1907–08, t. 76; Kunth, Rev. Gram. ii. t. 118 (*S. glauca* var. *elongata*).

Rhodesian Timothy (*Appleton*, No. 18, Herb. Kew).

Aboh, Nigeria (Barter, No. 139, Herb. Kew); Lagos (MacGregor, No. 170, Herb. Kew); known from the Gold Coast,

Central Chari region, Rhodesia, Natal, Somaliland, and in general widely distributed in Tropical and S. Africa.

A good hay or pasture grass, Rhodesia (Appleton, l.c.), a useful native hay grass (Transv. Agric. Journ. l.c.); not relished by cattle when green, but when ripe they like it and prefer it to ordinary veldt; makes a good weighty hay (Wood, l.c.).

A perennial, 5 ft. high, Aboh (Barter, l.c.), one of the commonest grasses of the African Savannahs (Stapf, Kew Bull. 1907, p. 214); on the African Plains, Gold Coast (Johnson, No. 725, Herb. Kew).

Setaria italica, *Beauv.*; Fl. Trop. Afr. IX. ined.

Ill.—Year Book, U.S. Dept. Agric. 1880, p. 384, t. 3; t. 27, f. 3 (dissections); Vasey, Agric. Grasses (Ed. 1) t. 16; Church, Food Grains, India, p. 55; Duthie, Field Crops, t. 25; Lisboa, Bombay Grasses, p. 32; Hitchcock, Grasses, p. 185, ff. 24, 25 (*Chaetochloa italica*); Piper, Forage Plants, p. 287, f. 29; Barber, Inter. Sugar, Journ. Dec. 1920, p. 684.

Vernac. names.—Foxtail Millet, Italian Millet, Boer Manna, Hungarian Grass (this name according to Hitchcock, Grasses, p. 184, being given to the form with small purple heads).

There are specimens in the herbarium from the Zambesi and British East Africa (Kenya Colony); but none from Nigeria. It is, however, so widely distributed in Tropical and Sub-Tropical countries, that it is here regarded as worthy of mention.

In India and many other warm countries the grain is largely used for food and also in India for cage-birds and poultry. In Europe and America the plant is of greater importance as forage, especially for cattle; but "Foxtail Millet" has long been regarded as unsatisfactory for horses unless fed sparingly (Piper, Forage Pl. p. 293) and this injurious effect upon horses is attributed to the seed if the hay is cut too late (Lyon & Hitchcock, U.S. Dept. Agric. Bull. No. 59, 1904, "Forage Crops in Nebraska," p. 46). "Boer Manna" is the staple hay crop in the Transvaal (Kew Bull. 1919, p. 20); but may be ousted by "Teff" (*see* p. 851).

An annual, 2–4 ft. high, propagated by seed of which half a bushel will sow an acre; it can be cut for hay in about 2 months from the time of sowing, recommended to be cut between the time of heading out and that of late bloom (Lyon & Hitchcock, l.c.). In Madras, the seed rate is given as 5–6 lb. per acre if irrigated, or half that quantity if on dry land; here the yield as a dry-land crop reaches 600 lb. of grain per acre and if irrigated 1000 lb. of grain, with 1000–2000 lb. of straw (Barber, Inter. Sugar Journ. Dec. 1920, p. 685). In some trials with "Boer Manna" in Rhodesia, as a fodder plant, the yield of hay has been 2400 lb. per acre (Walters, Rhodesia Agric. Journ. Oct. 1920, p. 433).

Ref.—"Millets of the Genus *Setaria*" in the Bombay Presidency and Sind, Gammie, Memoirs Dept. Agric. India, Bot. Ser. iv. Jan. 1911, pp. 1–8.——"Foxtail Millets or Mannas," Walters, in Agric. Journ. Union of S. Africa, ii. Aug. 1911,

pp. 184–186.——"Foxtail Millet (*Setaria italica*) in Fodder Plants and Their Culture," Piper, pp. 286–294 (The Macmillan Co. New York, 1915).

Setaria rubiginosa, *Miq.*; Fl. Trop. Afr. IX. ined. [*S. glauca* of most Tropical African authors, non. Beauv.].

Vernac. names.—Duza, Kyasuwar rafi, Kyasuwar ta fadana (Sokoto, Hausa, *Dalziel*).

Lagos (MacGregor, No. 143, 1902, Herb. Kew), Aboh (Barter, No. 309, Herb. Kew), Nupe (Barter, No. 1359), Yola, Abinsi (Dalziel, Nos. 272 (1909) and 868 (1912) Herb. Kew) and Mt. Patteh (Vogel, No. 173, Herb. Kew) in Nigeria; also known from Chari-Central and Rhodesia.

Considered locally to be good forage, horses and cattle eat it, Rhodesia (Appleton, No. 10, Jan. 1911, Herb. Kew); used for thatch, Nigeria (Dalziel, Hausa Bot. Voc. p. 28—*S. aurea*). Grain very much liked for "Bosso"—a time of famine bread, Abyssinia (Schimper, Herb. Kew).

An annual, 2 ft. high, open plains, Nupe (Barter, l.c.), found growing in swampy ground, Rhodesia (Appleton, l.c.); in meadows Abinsi and vicinity and damp places, Sokoto (Dalziel, ll.cc.) and in marshy ground and alluvial soil, subject to floods in the rainy season near the Umbaka river, N. Nyasaland (Scott, Herb. Kew).

Setaria sulcata, *Raddi*; Fl. Trop. Afr. IX. ined.

Vernac. names.—Kennema (Sierra Leone, *Lane-Poole*); Izeya (Rhodesia, *Swynnerton*); Uwondwe (Pemba Island, *Lyne*); Buffel-gras (Transvaal, *Burtt-Davy*).

Lagos, Opobo, Onitsha in Nigeria and known also from Sierra Leone, the Gold Coast, the Cameroons, Rhodesia, Fernando Po, Zambesi, and the Belgian Congo; in Natal and Tropical America.

A good fodder for cattle and horses, Sierra Leone, (Lane Poole, No. 451, 1916, Herb. Kew); a fodder grass, Rhodesia (Eyles, No. 1328, Herb. Kew); horses are very fond of it; said to be the best fodder grass in the Barberton District, Transvaal (Burtt-Davy, Transv. Agric. Journ. Jan. 1905, p. 290).

A perennial, 5–12 ft. high (Fl. Cap. vii. p. 421), 10 ft. high, Rhodesia, altitude 5000 ft. (Eyles, l.c.), about 8 ft. high, found by water, Lagos (MacGregor), about 6–8 ft. high, a conspicuous feature of the open country, Opobo (Jeffreys), 3–4 ft. in open spaces, Bonny (Kalbreyer); common everywhere, Sierra Leone (Scott Elliot) and common in damp situations, Lagos (Millen)—all notes on specimens in the Kew Herbarium—usually found in the shade of trees in dongas and where the conditions suit it sometimes grows 5–12 ft. high in the Transvaal (Burtt-Davy, l.c.).

Tricholaena, Schrad.

Tricholaena rosea, *Nees.*; Fl. Trop. Afr. ined.

Ill.—Wood, Natal Pl. ii. t. 180; Agric. Gaz. N.S. Wales, xix. Feb. 3, 1908, p. 121; Tracy, U.S. Dept. Agric. Farmers'

Bull. No. 726, 1916, p. 3, f. 2 (Seed heads); U.S. Dept. Agric. Bureau of Pl. Industry, Inven. Seeds & Pl. No. 39, 1917, t. 7; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 242, f. 147.

Vernac. names.—Um-kuana (Natal, *Wood*)—Natal Grass, South African Red-top, Australian Red-top, Hawaiian Red-top.

Widely distributed in Tropical Africa—more especially on the Eastern side, in Madagascar, South Africa, and South Arabia; cultivated in the United States.

A good hay grass, Transvaal (Kew Bull. 1911, p. 159); a valuable hay grass, Rhodesia (Mainwaring, No. 2627, 1919, Herb. Kew); relished by Stock (Transvaal Dept. of Agric. No. 3, 1908, Herb. Kew); cures easily and quickly into hay of the greatest value, Florida (Tracy, *seq.* p. 3); recommended for growing as green food for poultry, New South Wales (Agric. Gaz. N.S. Wales, 1908, p. 122); not a desirable lawn grass and regarded as being of only moderate value for pastures (Tracy, *seq.*).

A perennial; but may be grown as an annual; 3–4 ft. high, very variable in character. Propagated by seed or by division of the roots; when seed is used it is recommended to sow it broadcast—and because of the hairiness it is advisable to first moisten and roll in soil or wood ashes to effect an even distribution—at the rate of about 2–3 lb. per acre for early sowing and 8–10 lb. per acre for late sowing. In Florida it is found to be the best grass for well-drained sandy soils and it is recommended for growing between the trees in *Citrus* groves; it comes to maturity in about 3 months and cut when the best part of the seed begins to ripen the average yield of hay is $2\frac{1}{2}$–3 tons per acre and sometimes up to 4 tons may be expected; the best hay is that which is cured in the shortest time and with the least exposure to the weather, it is found to bale attractively and usually fetches the same price on the market as Timothy [*Phleum pratense*, Linn—an important hay and pasture plant in Britain and in America]; both stems and leaves being very palatable and eaten without waste (Tracy, *seq.*). The plant is said to resist drought well (Agric. Gaz. N.S. Wales, l.c.), and the bright red or crimson seed heads make it a good decorative plant, for which purpose it is often grown in European gardens.

Ref.—"Natal Grass (*Tricholaena rosea*)" in Forage Plants and Their Culture, Piper, pp. 258–259 (The Macmillan Co. New York, 1915).——Natal Grass: A Southern Perennial Hay Crop, Tracy, U.S. Dept. Agric. Farmers' Bull. No. 726, 1916, pp. 1–16.

Tricholaena sphacelata, *Bth.*; Fl. Trop. Afr. ined. [*T. rosea*, Nees, var. *sphacelata*, Benth.].

Vernac names—Eran Eye (S. Nigeria, *Dodd*); Maifarin Kai (Sokoto, *Dalziel*).

Lagos, Lokoja, Yola, Nupe, in Nigeria, also in Togoland, Angola, Ngamiland, Rhodesia and B.E. Africa (Kenya Colony).

A good fodder grass, Rhodesia (Appleton, No. 17, Herb. Kew) and may in all probability be equal to the foregoing species as a fodder plant, with which it has often been placed as a variety.

A perennial; about 2 ft. high, with silvery fluffy flowering panicle, Sokoto (Dalziel, Hausa Bot. Voc. p. 72—*T. rosea*, Nees, var. *sphacelata*); very abundant Yola (Dalziel); fairly common grass, roads and waste ground, and gravelly soil 3–4 ft. high, or average height 1–2 ft. Lokojə (Parsons), in cultivated grounds and open plains, Nupe (Barter) and found growing in clumps in the bush Rhodesia (Appleton)—notes on specimens in the Kew Herbarium.

Melinis, Beauv.

Melinis minutiflora, *Beauv.*; Fl. Trop. Afr. ined.

Ill.—Beauv. Agrost. t. 11, f. 4 (var. *pilosa*); Queensland Agric. Journ. ix. Aug. 1901, p. 215.

Vernac. names.—Capim mellado, Capim gordũra (Brazil, *Lamson-Scribner*).—Brazilian Stink grass, Honey Grass, Molasses Grass.

Native of Brazil; occurring in Tropical Africa, including Nigeria—specimen in Herb. Kew from Rabba Road (Parsons, Oct. 1907) in Madagascar, Ascension Island; introduced to Queensland, West Indies—under experiment in Dominica (Agric. News, Barbados, vii. 1908, p. 366: Rep. Bot. St. Dominica, 1908–09); Southern United States etc.; the var. *pilosa* Stapf, occurs in Natal, Nyasaland and on Mt. Ruwenzori; cultivated experimentally in the Philippines (Philippine Agric. Rev. 1912, p. 27).

An excellent fodder plant valued in Brazil for horses and cattle; may be used green or as hay; but recommended to be cut before the seed-heads show (Kew Bull. 1900, p. 31); an excellent grass for dairy cows (Lamson-Scribner, U.S. Dept. Agric. Div. of Agrostology, Bull. No. 14, 1898, p. 47).

A perennial, 3–4 ft. high.

Ref.—" Brazilian Stink Grass," Kew Bull. 1900, p. 31.

Pennisetum, Pers.

Pennisetum clandestinum, *Chiov.*; Fl. Trop. Afr. ined. [*P. longistylum*, var. *clandestina*, Leeke; *P. longistylum*, (?) ex Burtt-Davy, in Agric. Journ. Union S. Afr. ii. 1915, p. 147].

Ill.—Kew Bull. 1921, p. 91.

Kikuyu Grass (East Africa, S. Africa, *Pole-Evans, Burtt-Davy, Melle*).

British East Africa (Kenya Colony); Uganda, Tanganyika Territory, Abyssinia, Eritrea and introduced to South Africa under cultivation.

A fodder plant; " wild game are particularly fond of it " and on farms " all kinds of stock eat it greedily and it produces

a wealth of pasturage" (Burtt-Davy, Herb. Kew); "one of the most palatable grasses, all stock eat it greedily and will leave most grasses to get to it" (Melle, "Farmers' Weekly," Pretoria, May 23rd, 1917 and see Kew Bull. 1921, p. 86).

Perennial, with numerous stout rhizomes, running freely and covering sometimes an area of several square yards from one plant, low growing under dry conditions, 2½–3 ft. high, in moist soil and in districts where the rainfall is over 30 in., 2–3 cuttings a season are estimated as a possible crop (Kew Bull. l.c.); usually propagated in South Africa—as seeds are rarely produced—by taking the grass out in sod, which is cut up into pieces of about 3 in. square and planted out 6 ft. by 6 ft., or 6 ft. by 3 ft.—at the latter rate it takes "twenty bags of sod to plant an acre" and on fairly good soil it may cover the ground in a single season (Melle, Dept. Agric. Union S. Africa, Bull. No 5, 1918, p. 32) to the exclusion of all other grasses or weeds and grows well on any soil, on alluvial vlei, clay loam, sandy soil, etc., but thrives best on moist vlei soil (ll.cc.).

This grass is not recorded from Nigeria; but it is recommended for trial on the higher lands of the Northern Provinces.

Ref.—"Kikuya Grass" ("Agricultural Grasses and Their Culture"), Melle, Dept. Agric. Union of S. Africa, Bull. No. 5, 1918, pp. 32-35.——"Kikuya Grass (*Pennisetum clandestinum*, Chiov.)," Stapf, in Kew Bull. 1921, pp. 85–93.

Pennisetum pedicellatum, *Trin.*; Fl. Trop. Afr. ined.

Vernac. names.—[Kyasu, Kausuwa or Kamsua (Katagum), Fura (Kano) *Dalziel*]; Esu (Lagos, *MacGregor, Dawodu*).

Lagos, Nupe, Katagum and also known from Senegal, Sudan and in other parts of Tropical Africa and in India.

A fodder plant for cattle, Lagos (MacGregor, Herb. Kew).

An annual, stems 1–3 ft. high, a very common bush-grass, Katagum, a coarse tall grass with fluffy flowering heads, a common pest in waste places, in towns, Kano, etc. (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 69); an annual found about villages, Nupe (Barter, Herb. Kew), in open country, banks of Guara River, N. Nigeria (Elliott, Herb. Kew).

Pennisetum polystachyum, *Schult.*; Fl. Trop. Afr. ined. [*P. setosum*, Rich. in Pers. Syn. ii. p. 729].

Ill.—Trinius, Sp. Gram. Ic. t. 20; Kunth, Rév. Gram. i. t. 39 (*P. Richardi*); Duthie, Indig. Fodder Gr. N. India, t. 49 (*P. holcoides*); Brown & Hunter, Pl. Uganda, p. 76 (*P. setosum*); Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 248, f. 150 (*P. setosum*).

Vernac. names.—Kansua, Kamsua or Kyasuwa (Hausa, *Dalziel*); Fura (Kano, *Dalziel*); Bisagazi (Uganda, *Brown & Hunter*).

Nupe, Katagum, Lokoja, Jeba, in N. Nigeria, Lagos, Opobo, Ilosun, Ogurude (Cross River), Oban in S. Nigeria, Gold Coast and other parts of Tropical Africa, in India and Tropical America.

A forage plant much liked by cattle and sometimes cut and dried for horses, Western Sudan (Chevalier, Journ. d'Agric. Tropicale, 1911, p. 97, Bull. Bureau Agric. Int. Rome, June 1911, p. 1318—*P. setosum*). A sample of this grass, submitted by the Department of Agriculture, Entebbe, to the Imperial Institute, was found on investigation to be of satisfactory composition as a fodder, closely resembling "Elephant Grass" (*Pennisetum purpureum*)—the analysis showed, Crude proteins, 9·9 per cent.; Fat. 2·7; Carbohydrates, 38·6; Fibre, 40·1 and Ash, 8·7 per cent. The nutrient ratio was given as 1 : 4·5 and the Food units as 70 and the sample was free from cyanogenetic glucosides (Ann. Rept. Dept. Agric. Uganda for 1920 (pub. 1921) p. 52).

Annual (Fl. Br. India, vii. p. 87); 5–6 ft. high, about towns and villages (Barter, Herb. Kew); an annual 30–50 cm. high, Western Sudan (Chevalier, l.c.); a coarse tall grass with fluffy flowering heads, a common pest in waste places in towns, Kano etc., very common, Lokoja, N. Nigeria, (Dalziel, Herb. Kew: Hausa Bot. Voc. p. 69), plentiful in creeks and ditches, Burutu (Parsons, Herb. Kew); a "bulrush grass"—grows in open places where jungle has been cleared, Opobo (Jeffreys, Herb. Kew). The Uganda grass above mentioned was raised from seed collected from plants growing in a savannah near Entebbe.

Pennisetum purpureum, *Schum.*; Fl. Trop. Afr. ined. [*P. Benthamii*, Steud.].

Ill.—Ann. Rep. Bot. Dept. Uganda, 1913, p. 29 (a view of "Elephant Grass"); Rhodesia, Agric. Journ. x. 1913, tt. 1–4; Notizbl. Bot. Gart. Berlin, App. xxii. 7th Nov. 1909, p. 48, f. 18.

Vernac. names.—Esun funfun (S. Nigeria, *Dodd*); Esun (Lagos, *Millen*); Esu-pupa (Lagos, *MacGregor*); Shibra or Shura, Yanbama (Sokoto, *Dalziel*); [Zinyamunga (Rhodesia, *Kenny*); Marabagunda or M'ramba munga (Rhodesia, *Napier, Mundy*); Maweengo-weengo (Madi, Uganda, *Grant*); Ada (Togoland, *Stapf*); Madiadi (Lower Congo, *Laurent*); Dilenge (Katanga, *Verdick*); Mariango, Massango etc. (Angola, *Welwitsch*), Mbuhu, Nguhu (Usambara, *Holst*) *Stapf*]; Napier's Fodder, Elephant Grass.

Lagos, Sokoto, Ogurude (Cross River), Abinsi etc. in Nigeria, and found also in West Africa from Sierra Leone to the Cameroons, Angola, Congo and Zambesi river regions, Tanganyika Territory (German E. Africa), Rhodesia etc.

A fodder grass for both cattle and horses, strongly recommended in Rhodesia, Cameroons, Uganda and other parts of Africa. The spike of "Shibra" or "Shura" is stripped while young and soft and used as food in soup, &c. Sokoto (Dalziel, Herb. Kew, Hausa Bot. Voc. p. 37). Fences surrounding the compounds and walls of huts are built up of the stems in Uganda (Grant, Trans. Linn. Soc. xxix. p. 172; Kew Bull. *seq.*) where also sharp-edged strips are sometimes used for cutting up meat and also for cutting into fragments the victims of the King of Uganda

(Grant, l.c.). An analysis for fodder shows Water, 61·81 per cent.; Ether Extract, 0·29; Protein (Nitrogen x 6·25), 2·92; Carbohydrates, 17·29; Woody fibre, 14·77 and Ash, 2·92 per cent. (Kew Bull. *seq.*). The stems have been examined at the Imperial Institute with a view to use for paper-making. A consignment from Uganda of 177 lb.—described as bamboo-like stems, measuring up to 11 ft. in length and about one inch in diameter at the base—which after air-drying on receipt weighed 145 lb. Analysis showed Moisture on drying at 100°–110° C., 10·7 per cent.; Ash expressed on the dried material, 5·1; Unbleached pulp—expressed on material as received 23·9, on air-dried material 29 and on material dried at 100°–110° C., 32·5 per cent.; the pulp was of good colour and was composed of ultimate fibres (0·05–0·14 in., average 0·08 in.) rather longer than those of "esparto grass" (0·012–0·12 in., average 0·045) and of about the same length as those of bamboo pulp (0·024–0·16 in., average 0·096 in.); it furnished a fairly good paper, and the value in London (Feb. 1913) was estimated at approximately the same value as wood-pulp prepared by the soda process, viz. £7 10*s.* 0*d.*–£8 12*s.* 6*d.* per ton. Stems converted into pulp by treatment with caustic soda, in the country of origin was suggested as the best condition in which to ship, as in competition with "esparto grass" (*Stipa tenacissima*, Linn.), then (Feb. 1913) at £3 7*s.* 6*d.* a ton, the shipment of stems would not be profitable (Bull. Imp. Inst. 1913, p. 68).

A perennial, with a creeping rhizomes, culms, 6–10 ft. sometimes up to 20 ft. or so, high, about ½–1 in. thick at the base. Seeds do not appear to be easy of collection and propagation is best effected by division of the roots. It grows quickly, stands cutting well and is perhaps more valuable as a soilage crop than for pasture or hay; the sample of which an analysis is given above was planted in March 1910 and cut July 1911 (no cutting done meantime) when the length of stalk was 8 ft. and the length of leaf 2 ft.; but in practice 3 or 4 cuttings while the grass is young and tender would be possible in the same period. The plant is reported to be a good drought resister; but seems to find the best conditions of growth in moist or marshy land. In Sokoto it has been collected in a field of cultivated millet or "gero" (*Pennisetum typhoideum*) and said to be often planted as a boundary; it also forms dense masses on the banks of the Benue and Katsina rivers (Dalziel, Herb. Kew); plentiful on the banks of the Ogun river, Lagos (Millen, Herb. Kew) at Ogurude, Cross River (Holland, Herb. Kew), in Savannah country, Gold Coast (Chipp, List Herbac. Pl. Gold Coast, p. 23); forms extensive reed jungles in the delta of the Zambesi and along the Shire river in East Africa and in general wherever it is known, occurs mainly along water-courses and in marshy depressions, though also growing in bush and forest where open spaces admit of sufficient light (Stapf, Kew Bull. 1912, p. 312).

Ref.—"Elephant Grass (*Pennisetum purpureum*, Schum.). A New Fodder Plant," Stapf, Kew Bull. 1912, pp. 309–316.——

Ibid. in Rhodesia Agric. Journ. x. Feb. 1913, pp. 362–368.——"Elephant Grass or Napier's Fodder," Walters, l.c. x. Aug. 1913, pp. 833–836; pls. i.–iv.——"Elephant Grass as a Paper Making Material," Bull. Imp. Inst. xi. 1913, pp. 68–70.

Pennisetum spicatum, *Koern.*; Fl. Trop. Afr. ined. [*P. typhoideum*, Rich.; *Penicillaria spicata*, Willd.; *Panicum americanum*, Linn.].

Ill.—Beauvois, Agrost. t. 13, f. 4 (*Penicillaria spicata*); Jacq. Eclogae Gram. t. 17 (*P. spicata*). Delile, Egypte, t. 8, f. 3; Church, Food Grains, India, App. pp. 56, 57; Duthie Field Crops, t. 71; Lisboa, Bombay Grasses, p. 34; Wood, Natal Pl. v. t. 480; Hitchcock, Grasses (1914) p. 186, f. 26 (*P. glaucum*) and U.S. Dept. Agric. Bull. No. 772, 1920, p. 246, f. 149 (*P. glaucum*).

Vernac. names.—Gero (Nupe, Barter); Gero, Maiwa, damro (Hausa, *Dalziel*); Mishuera (Zambesi, *Kirk*); Dukhu or Dookhr (Arabic, *Schweinfurth, Bromfield*); Dukhu (Sudan, Col. Rep. Ann. No. 816, 1914, p. 35); Shessab (Tripoli, *Barber*); Um-velli-velli (Matabele, *Burtt-Davy*); Leeuja (Msutu, Transvaal, *Burtt-Davy*); Amabile (Kafir, *Nelson*); Bultuc (Eritrea, *Manetti*); Sannio (Mandingo, Gambia, *Dudgeon*); Mawali (Zanzibar, Bull. Imp. Inst. 1914, p. 341); Bajra (India, *Watt*).——Cumboo or Spiked Millet, Pearl Millet, Bulrush Millet, Kaffir Manna-Koorn.

Widely distributed in Tropical Africa and Asia; introduced to the United States and S. Europe.

The grain is a staple food of the natives in Nigeria and probably all over Tropical Africa, in India where the plant is sometimes cut green and also after the grain is ripe for fodder; both the grain and leaves are used for cattle food in N. Nigeria (Dudgeon, Agric. & For. Prod. W. Africa, p. 148). Grown to a limited extent in the Southern United States for forage (Hitchcock, Grasses, p. 186), used more particularly as soilage, cut before the stems become hard and woody. The crop in the grain is usually subject to much loss by birds and might therefore be recommended for feeding poultry and game in this country; a sample of the grain, with this view, was submitted to Kew in 1918). It is much used as food for poultry in South Africa (Walters, Agric. Journ. Union of S. Africa, Aug. 1911, p. 187). A sample of grain from Pateji, N. Nigeria, submitted to the trade (1910), was unknown to English buyers and being too small for analysis was not valued as a food-grain (Col. Rep. Misc. No. 71, 1910, p. 212); but the analysis of a sample from Zanzibar shows:—Moisture, 10·6; Crude proteins, 12·47 (True proteins, 11·37; other nitrogenous substances, 1·1); Fat, 5; Starch, etc., 67·13; Fibre, 2·8 and Ash, 2 per cent.; Nutrient ratio, 1: 6·3, and Food Units, 110·8; no cyanogenetic glucosides. The grain did not come on to the English market regularly; but consignments would probably have realised (May 1913) about 22*s*. per 480 lb. (Bull. Imp. Inst. 1914 p. 341).—from India this grain is to some extent exported to other countries by sea; but the trade returns include it under "juar" (*Sorghum*) (Watt, Dict. Econ. Prod. India). In the South-west Congo the natives

make a flour which the Europeans there used mixed with wheat-flour, and the stems after the ears are harvested are used for feeding cattle (Bull. Agric. Congo Belge, 1912, p. 666); the flour is employed in the preparation of a porridge and for making beer; the grains are used also in the starch factory and in the distillery, Eritrea (Manetti, Agric. Col. Italy, 1911, p. 100; Bull. Bur. Agric. Int. Rome, April 1911, p. 829); the grain is also used for making beer in S. Africa (Walters, l.c.) on the Niger and Gambia (Mus. Kew) and " Gero " is ground up for eating uncooked with milk and other food, Nigeria (Dalziel, Hausa Bot. Voc. p. 38).

An annual, 3–10 ft. high; culms stout, erect, the spike bearing many grains—upwards of a foot long, comes to maturity in from 3–5 months, the cultivation in general being much the same as for Guinea Corn (*Sorghum*); but it appears to be a better crop for drier regions. In Nupe it is sown in March and April with the first rains, ripens in July and August, said not to be a productive grain, considering the space it requires; but " Dawa " (*Sorghum*) is always planted with it to ripen at Christmas (Barter, Herb. Kew). It is usual to plant millet seed before the Guinea Corn, generally about the middle of April or as soon as the first showers are experienced, the crop is ready for picking in June and July and much less rain is required for this crop than for Guinea Corn in N. Nigeria. There is a small-spiked form of millet known as " Ligi " (in Beri-beri) which may belong here, cultivated on the banks of Lake Chad; it is sown as the water recedes and grown without rainfall (Lamb, No. 109, 1921, Herb. Kew). On the Gambia " Sannio " is grown alternately with " Guinea Corn " or " Maize " (Dudgeon, Agric. & For. Prod. W. Africa, pp. 12, 148) and round the villages there always exist fields of greater or less extent (Kew Bull. 1892, p. 45). In India, where it is generally grown mixed with minor crops—" Mung " (*Phaseolus radiatus*) etc.—the seed is sown at the rate of 2½–3 seers (5–6 lb.) per acre, yielding 5½–7 maunds (450–570 lb.) of grain and about 30 maunds (2460 lb.) of dry fodder. The average yield on dry lands is 1–7 cwt. per acre (Watt, Comm. Prod. India, p. 870); average 500 lb. of seed in Georgia (Piper, Forage Pl. p. 303).

The grain is easily stored and keeps in good condition for a long time (Dudgeon, l.c.). In the Museum at Kew there is a specimen showing the method of conveying the spikes to market in certain parts of the Niger region—there are about 172 spikes, 86 arranged on each side of the plaited centre of stalks to admit of rolling into a bundle, and carrying conveniently on the backs of oxen.

The plant is very variable under cultivation and there are several distinct varieties and numerous forms occurring in India and Africa [*see* Hooker, Fl. Br. India, vii. p. 83].

The yield in Katagum on a farm of about 2½ acres has been given at a total production of 38 bundles average weight of each

in stalk 75 lb. and when threshed 44 lb., average price per bundle 6*d.* (Morgan-Owen, N. Nig. Gaz. Suppl. No. 9, May 15th, 1913, p. 182). In Sokoto a farm of 3 acres, manured yielded 33 bundles, of a total weight (stalked) 2244 lb. (threshed) 1435½ lb., total value of threshed grain £1 15*s.* 10*d.* (20 lb. for 6*d.*) (Malcolm, l.c. p. 184).

Ref.—" Bulrush Millet—*Pennisetum typhoideum*," in Food Grains of India, Church, pp. 56–59.——" *Pennisetum typhoideum*," in Dict. Econ. Prod. India, Watt, vi. 1892, pp. 127–131.——" Millet ou petit mil (*Pennisetum spicatum*)," Dumas in L'Agric. prat. pays chauds (" L'Agric. dans la Vallée du Niger ") v. 2, 1905, pp. 526–528.——" Pearl Millet or Kaffir Manna-Koorn (*Pennisetum spicatum*)," Burtt-Davy, in Transv. Agric. Journ. iii. Jan. 1905, p. 286.——" *Pennisetum typhoideum*," in The Commerical Products of India, Watt, pp. 869–872 (John Murray, London, 1908).——Pearl Millet, Ball, U.S. Dept. Agric. Farmers' Bull. 168, 1908, pp. 1–15.——" Le Millet à Chandelle dans la région du Kasai," L.P. in Bull. Agric. Congo Belge, iii. Sept. 1912, pp. 666–668; abstract (translation) in Bull. Bur. Agric. Int. Rome, iii. 1912, pp. 2635–2636.——" Gero " in Crop Statistics, Morgan-Owen (Katagum), Monsell (Kano) Miller-Stirling (Northern Div.), Gepp (Katsina), Malcolm (Sokoto), in N. Nigeria Gaz. Suppl. May 15th, 1913, pp. 182–184.——" Mawali (*Pennisetum typhoideum*)," in Bull. Imp. Inst. x. 1914, p. 341, from Zanzibar.——" *Penicillaria* (*Pennisetum glaucum*) " in Forage Plants, Piper, pp. 301–303 (The Macmillan Co. New York, 1915).——" Bulrush Millet (*Pennisetum typhoideum*)," Barber, in The Inter. Sugar Journ. xxii. Dec. 1920, pp. 684–685.

CENCHRUS, Linn.

Cenchrus catharticus, *Delile*; Fl. Trop. Afr. ined.

Ill.—Duthie, Indig. Fodder Gr. N. India, t. 11.

Vernac. names.—Karangia or Karangiya (Katagum, *Dalziel*); Dane, Kramkram (F. W. Africa, *Chevalier*).—Bur Grass, Prickly Bur Grass.

Lagos, Katagum, Lokoja, Nupe, in Nigeria and in other parts of Tropical Africa, in India and Arabia.

Seeds edible and the plant a good fodder, Nigeria (Dalziel, Hausa Bot. Voc. p. 47); seeds eaten in times of scarcity; plant eaten when young by cattle; it is considered by some to be an excellent fodder, by others only middling, India (Watt, Dict. Econ. Prod. India). The burs are a serious drawback to the use of the plant for fodder when mature.

An annual, found about towns and villages, Nupe (Barter, Herb. Kew).

TRICHOPTERYX, Nees.

Trichopteryx nigritiana, *Stapf*; Fl. Trop. Afr. ined.

Vernac. names.—Ajo (Agolo, S. Nigeria, *Thomas*); Osi Ata (Ila, S. Nigeria, *Thomas*).

Nupe, Jeba, Abinsi, etc. in N. Nigeria, Agolo, Ila, S. Nigeria. Used for roofing, S. Nigeria (Thomas, Herb. Kew).

Abundant in bush, growing 4–5 ft. or more, Abinsi (Dalziel, Herb. Kew). Immense plains in Borgu of an allied species (*T. hordeiformis*, Stapf)—an annual—are described by Barter (Herb. Kew; Kew Bull. 1897, p. 298) as resembling "barley crops in Northern Hants."

Trichopteryx simplex, *Hack.*; Fl. Trop. Afr. ined.

Ill.—Wood, Natal Pl. ii. t. 185.

Oban, S. Nigeria, and also known from Rhodesia and S. Africa.

Considered good forage until the seed matures, Rhodesia (Appleton, Herb. Kew); readily eaten, but not of much value, Transvaal (Kew Bull. 1911, p. 159).

Culms 2–3 ft. long, densely tufted (Fl. Cap. vii. p. 450); in flower January near Chirinda, Rhodesia, altitude 3700 ft. (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 233).

PHRAGMITES, Trin.

Phragmites communis, *Trin.*; Fl. Trop. Afr. ined.

Ill.—Smith & Sowerby, Eng. Bot. t. 401 (*Arundo Phragmites*); Knapp, Gram. Brit. t. 95 (*A. Phragmites*); Host. Gram. Austr. iv. t. 39 (*A. Phragmites*); Kunth, Rev. Gram. i. t. 50 (*P. mauritiana*); Fl. Danica, t. 2464; Zenker, Fl. Thuringen, v. t. 563; Syme, Eng. Bot. (ed. 3) t. 1727; U.S. Dept. Agric. Rep. Bot. 1880, t. 15, t. 28, f. 15; Sowerby & Johnson, Grasses, Gt. Britain, t. 118; Useful Pl. Gt. Britain, t. 22, f. 259 (*A. Phragmites*); Vasey, Agric. Grasses (ed. 1) t. 87, (ed. 2) t. 68; Wood, Natal Pl. ii. t. 193; Hitchcock, Grasses, U.S. Dept. Agric. Bull. 772, 1920, p. 65, f. 27.

Vernac. names.—Ifu (Lagos, *Millen*); [Machara, Wuchiar Giwa or Wutsiyar giwa (Hausa, Katagum); Gabara (Sokoto), *Dalziel*]; Bus (Arabic, *Muriel*); Mataetae (Unyoro, *Grant*); Carrizo (Mexico, United States, *Hitchcock*); Common Reed; Roseau Commun (French); Roseau à balais.

Lagos, Brass, Nupe, Katagum, N. Bornu, Lake Chad, in Nigeria, and in S. Africa, Somaliland, Mediterranean region, India, and cosmopolitan near watercourses in nearly all countries.

Stems used for flutes and pipe stems, Sokoto (Dalziel, Hausa Bot. Voc. p. 31—*Arundo Donax*); for flutes and whistles, Unyoro (Grant, Trans. Linn. Soc. xxix. p. 173); natives form pipe tubes of the large hollow stems, Nupe (Barter, Herb. Kew); used for arrows, Lagos (Millen, Herb. Kew); used for roofing, Lahoul, India, and for making sandals, Panjab (Watt, Dict. Econ. Prod. India); for lattices in the construction of adobe huts in S.W. United States, shafts of arrows by the Indians and for mats and screens in Mexico and Arizona (Hitchcock, l.c. p. 64); for thatching—found to be more durable than straw,

forms a good foundation for plaster-floors, in demand by brick-makers, garden screens are made of them, occasionally serve for arrows, and till the introduction (in the viith century) of pens made from the quills of birds, they were used for writing; the young shoots when cut off from the root where not exposed to the light make an excellent pickle, the creeping stems are very nutritious and might be used as fodder in times of scarcity, Britain (Syme, Eng. Bot. xi. (1872) p. 59); cattle eat the young grass and it is collected largely for fodder in Afghanistan (Watt, l.c.); the young tops have been recommended for feeding stock, Britain (Leaflet No. 34, 1915, Ministry of Agric. "Autumn & Winter Fodder," pp. 2–3). In Sweden the country people use the panicle to dye woollen cloth green (Syme, l.c.).

There are specimens of paper made of this reed, in the Museum at Kew, one sample made of reeds grown on the banks of the Tay, near Errol (1876) one of reeds grown at Keyhaven, near Milford-on-Sea (1916) and a sample of so-called "Delta Grass" Pulp made from a grass (believed to be this species) growing at the mouth of the Danube.

A perennial, culms erect, 4–10 ft. high; found on grassy islets and on low banks in many parts of the river (Niger) in Nupe (Barter, l.c.), a tall grass, shore of Lake Chad (Elliott, Herb. Kew), by rivers, Sokoto, Katagum (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 31—*Arundo Donax*); grows in marshes, around springs and along lakes and streams throughout the United States (Hitchcock, l.c.); recommended as a good soil binder on banks of rivers of Britain where much of the lowland of our larger rivers has been reclaimed partly by the growth of this reed (Syme, l.c.), and extensive fens are covered with it; valued also for binding loose soils in India where it is found in the plains of the North-West and up to 14,000 ft. on the Punjab Himalaya (Watt, l.c.). "Plav" is a floating fen formed of reed—*Phragmites communis*, Trin. var. *flavescens*, Gren. & Godr., built up almost entirely of vertical reed-rhizomes, which with the aid of their roots, retain much soil (Pallis, Journ. Linn. Soc. *seq.* p. 271) and the description is stated to apply also to the reed of East Anglia (*Phragmites communis*, Trin.) which gives rise to the "Fens" of the Norfolk Broads (l.c. p. 246).

Ref.—"Roseau à Balais (*Arundo phragmites*) in Les Pl. Industrielles, Heuzé, pp. 301–303 (Libr. Agric. de la Maison Rustique, Paris, 1893).——"The Structure and History of Plav: the Floating Fen of the Delta of the Danube," Marietta Pallis, in Journ. Linn. Soc. xlii. July 7th, 1916, pp. 233–288, illustrated—having special reference to *Phragmites*.

ARISTIDA, Linn.

Aristida Adscensionis, Hook. f., Fl. Trop. Afr. ined.

Ill.—Cav. Ic. v. t. 471, f. 2 (*A. interrupta*); vi. t. 589, f. 1 (*A. elatior*); Jacq. Eclogae Gram. t. 6 (*A. divaricata*); Desfont. Fl. Atlant. i. t. 21, f. 2 (*A. coerulescens* var. *typica*); Kunth,

Rev. Gram. i. t. 44 (*A. mauritiana*); Trinius, Sp. Gram. Ic. t. 313 (*A. coerulescens*); Duthie Indig. Fodder Gr. N. India, t. 30 (*A. Hystrix*).

Vernac. name.—Oka Olongo (S. Nigeria, *Dodd*).

Lagos, also known from the Gold Coast, Sudan, Somaliland, and found in S. Africa, India, Burma, Ceylon and in many warm countries.

A good feeding grass, Somaliland (Appleton, Herb. Kew; Kew Bull. 1907, p. 216); a favourite food for cattle in N. India —too fine to be cut with a scythe and too short and light to stack (Watt, Dict. Econ. Prod. India—*A. depressa*).

Annual or occasionally perennial; culms tufted, slender a few inches to 2 ft. long (Fl. Cap. vii. p. 554) 1½–2 ft. long (Kew Bull. l.c.); very common on dry sandy plains around Accra (Brown, Herb. Kew); grows in a dry, barren, binding soil, in the plains of N. India (Watt, l.c.).

Aristida stipoides, *Lam.*; Fl. Trop. Afr. ined.

Ill.—Trans. Linn. Soc. xxix. t. 114, f. 1 (*A. gracillima*); Agric. Gaz. N.S. Wales, vii. Oct. 1896, p. 650; Maiden, Grasses, N.S. Wales, p. 106.

Vernac. names.—Katsaimu, Garasa, Wutsiyar Jaki, Tsintsiyar Kogi or Maza (Hausa, *Dalziel*).—A Wire Grass.

Sokoto, Katagum, etc. in Nigeria and in Tropical Africa from Senegal in the West to Tanganyika Colony in the East. Also in Australia.

Commonly used for thatching, N. Nigeria (Dalziel, Hausa Bot. Voc. p. 60). The sharp awns make this grass of little or no value for fodder and it has been recorded of it " a hard dry wiry grass which is as a rule but little relished by animals of any kind, when burnt off it produces a moderate quantity of tender feed but this soon becomes of a hard fibrous nature" (Maiden, Agric. Gaz. N.S. Wales, vii. 1896, p. 650); " the worst of all species for forage, the awns are most troublesome both to the animal's eyes and the wool " (Turner, Grasses, N.S. Wales, p. 6).

A perennial, 1–2 ft. high, found in ridges in the interior, Australia (Turner, l.c.). A tall grass, Sokoto, etc. (Dalziel, l.c.).

Perotis, Ait.

Perotis latifolia, *Ait.*; Fl. Trop. Afr. ined.

Ill—Beauvois, Agrost. t. 4, f. 9; Kunth, Rév. Gram. i. t. 92.

Vernac. names.—Wutsiyar Kurege or Bundin Kurege (Hausa. *Dalziel*).

Lagos, Nupe, Yola, etc. in Nigeria; also known from the Gold Coast, Somaliland, Uganda, Rhodesia, Transvaal and Natal and in general recorded as occurring throughout Tropical

Africa and Asia (Fl. Cap. vii. p. 575)—including India from the Panjab to Burma, the Malay Peninsula, etc. (Fl. Br. India, vii. p. 98).

A good forage plant, Rhodesia (Appleton, No. 3, 1911, Herb. Kew) included amongst Fodder Grasses of N. India (Duthie, p. 22; Kew Bull. 1907, p. 217).

An annual, 3 ft. high, a beautiful grass found chiefly in fields or in ground under cultivation, Nupe (Barter, No. 754, Herb. Kew); culms 1½ ft. long (Fl. Cap. l.c.); a very beautiful grass found growing in clumps in the bush, Rhodesia (Appleton, l.c.); a slender grass, stems stout and branching at the base, then ascending 3–10 in. (Fl. Br. India, l.c.); a grass about 12–18 in. high, with a bottle-brush-like flowering spike, common in Yola (Dalziel, Hausa Bot. Voc. p. 102 : Herb. Kew).

Sporobolus, R. Br.

Sporobolus festivus, *Hochst*; Fl. Trop. Afr. ined.

Ill.—Wood, Natal Pl. v. t. 405.

Vernac. name.—Kakin furtau (Sokoto, Hausa, *Dalziel*).

Sokoto, Katagum in Nigeria, found in Somaliland and in several varieties throughout Tropical and S. Africa (Kew Bull. 1907, p. 219).

Sometimes mixed with other grasses for thatching, Sokoto (*Dalziel*, Hausa Bot. Voc. p. 46).

A small slender grass of the bush or waste fields, Sokoto, very abundant, Katagum (Dalziel, l.c. and Herb. Kew).

Sporobolus indicus, *R. Br.*; Fl. Trop. Afr. ined.

Ill.—Trinius, Sp. Gram. Ic. i. t. 56 (*Vilfa capensis*); U.S. Dept. Agric. Rep. Bot. 1878, t. 14; 1880, t. 30, f. 14 (fl. only); Agric. Gaz. N.S. Wales, ii. 1891, t. 29; v. 1895, p. 389; Turner, Austr. Grasses, i. p. 52; Wood, Natal Pl. v. t. 408; Queensland Agric. Journ. xxx. May 1913, p. 318.

Vernac. names.—Ratua, Ghorla, Khir, Tomagarika (India, *Watt*); Jil-crow-a-berry (N. Australia, *Maiden*).—Rat-tail Grass, Chilian Grass (Maiden); Paramatta or Tussock Grass (Turner).

Oban (Talbot), in S. Nigeria, Cameroons, Tanganyika Territory (G.E. Africa), Abyssinia, S. Africa, St. Helena, Australia, India, Burma, Ceylon, and many warm countries.

Eaten when young by stock; but soon becomes tough and wiry when it is usually avoided except when other fodder is scarce, Transvaal (Kew Bull. 1911, p. 160); cattle and horses eat it and it is considered locally to be good forage, Rhodesia (Appleton, Herb. Kew); affords capital feed in a young state; but when old is very tough and wiry (Turner, "The Grasses of N.S. Wales" in Agric. Gaz. N.S. Wales, 1891, p. 307); yields a fair amount of fodder much relished by stock; but too coarse for sheep; the seed is the principal food of many small birds, Australia (Maiden, Useful Native Pl. Australia, p. 109); fodder

for cattle, seeds much liked by birds and poultry, Natal (Wood. Natal Pl. v. t. 408).

A perennial, culms 2–3 ft. long, tufted (Fl. Cap. vii. p. 586); stem 2–3 ft. sometimes as thick as a small goose-quill at the base (Fl. Br. Ind. vii. p. 247); wiry and very strong, usually found on road-sides, old land and farmsteads, Transvaal (Kew Bull. l.c.).

Sporobolus pyramidalis, *Beauv.*; Fl. Trop. Afr. ined.

Vernac. names.—Ilute emji nuono (Agaku, S. Nigeria, *Thomas*); Pahe, Mendo (Sierra Leone, *Thomas*).

Opobo, Lagos, Katagum, Abinsi, etc. in Nigeria; also in Sierra Leone, Gold Coast, Congo, Angola, etc.

A good fodder, Sierra Leone (Scott Elliot, Herb. Kew); grains eaten in times of famine, Uganda (Speke & Grant, Herb. Kew).

Average height 3 ft. (Grant, l.c.), common in bush and waste places, Abinsi (Dalziel, Herb. Kew), a grass typical of Savannah Forest, Gold Coast (Chipp, Herb. Kew).

Sporobolus spicatus, *Kunth*; Fl. Trop. Afr. ined.

Ill.—Trinius, sp. Gram. Ic. t. 12 (*Vilfa spicatus*); Delile, Fl. Egypte, t. 10, f. 1 (*Agrostis spicatus*).

Bornu—shore of Lake Chad, Sudan, Somaliland, Kenya Colony (B.E. Africa) and other parts of Tropical Africa; in Arabia, India, etc.

An excellent fodder plant, Somaliland (Appleton, Kew Bull. 1907, p. 219).

Root-stock stoloniferous, stem 6–12 in. high, found on the sea-shore, Red Sea Province, Sudan (Crossland, Herb. Kew), growing in sand close to high-water mark, Coast, B.E. Africa (Battiscombe, Herb. Kew); near water, Somaliland (Appleton, l.c. & Herb. Kew) and as a binding grass of the sand-dunes, Cape Verd Islands (Moseley, Challenger Exped. 1873, Herb. Kew).

Eragrostis, Beauv.

Eragrostis abyssinica, *Schrad.*; Fl. Trop. Afr. ined.

Ill.—Transv. Agric. Journ. iii. 1905, t. 83; Agric. Journ. Union of S. Africa, v. Jan. 1913, p. 29.

Vernac. names.—Ttheff, Tteff, or Thaff (Abyssinia, *Richard*)—Teff grass.

Native of Abyssinia; introduced through Kew to various British Possessions in 1886 (seed obtained from Abyssinia), including West Africa, India, Australia, Natal, B. Guiana and later to California and the Transvaal, B.E. Africa (Kenya Colony).

A valuable hay and pasture grass, suitable for all kinds of stock; the seed, in the country of origin and in Eritrea, is used for making bread. An analysis of the grain (Red Teff), shows. Water, 15·2; Albuminoids, 8·2; Starch, etc., 68·1; Oil, 2·8; Cellulose, etc. 2·8; and Ash, 2·9 per cent. (Kew Bull. Jan. 1887,

p. 6); and of the hay—Moisture, 8·88; Ash, 5·55; Protein, 6·21; Soluble Carbohydrates, 39·08; Ether Extract, 1·21; Crude fibre, 39·07 per cent. (l.c. 1913, p. 38).

An annual, 2–4 ft. high, which under favourable conditions comes to maturity in from 2–3 months—("Thaf Tseddia," the quick growing variety) or up to 5 months ("Thaf Hagaiz," slow growing variety) both distinguished chiefly as white and red. In India sown in July (rainy season) and cut in the middle of August, the green crop weighed 16,000 lb. or from 2000–3000 lb. of dried hay per acre (*see* Kew Bull. Jan. 1887 and 1913, p. 33); in the Transvaal, sown November 26th (1904) and cut for seed February 20th (1905) or 12 weeks from sowing, with 7·12 inches of rain during the growing period, the yield of green forage was over 4 tons (10,285 lb.) per acre and a yield of 4 tons of hay per acre, has been reported (l.c. p. 36). The seed weighs 63 lb. per bushel and the yield has been found to be 1500 lb. per acre (l.c. p. 35). In B.E. Africa (Kenya Colony) nursery plants have yielded at the rate of 14 cwt. of seed and 4 tons of green fodder per acre (Ann. Rep. Dept. Agric. Exp. Farm, Kabete, B.E. Africa, 1912–1913, p. 119).

Experiments are being made with Teff in Nigeria; but there appears to be little information available; at Maigana in 1914, a light crop was obtained on a plot less than an acre and fed to cattle (Rae, Ann. Rep. Agric. Dept. N. Prov. Nigeria, 1914, p. 13) and the report for 1917 was to the effect that "owing to a fire the whole of the seed available for planting was destroyed. More seed is being obtained, when the experiment will be continued (Rae, Ann. Rep. Dept. Agric. N. Nigeria, 1917, p. 10).

This grass seems to be well worthy of development—in the Transvaal (introduced in 1903), within ten years of its introduction it "raised scores of small farmers from poverty to comparative comfort," and established an important dairy industry (Kew Bull. 1913, p. 38). In 1920 it was estimated that the Union of S. Africa had some 250,000 acres under "Teff" of the annual value £1,000,000 (Burtt-Davy, letter to Director, July 1st, 1920) and in Australia its value for fodder purposes is considered exceptionally high, chiefly merited by the short period of growth before maturity and suitability for dry sandy regions where few other grasses would thrive with equal success (Kew Bull. 1913, p. 33 & 1894, p. 378). In Eritrea the cultivation is said to be the same as for barley (Manetti, Agric. Col. Italy, v. March 1911, p. 103; Bull. Bur. Agric. Inst. Rome, April 1911, p. 829).

Ref.—"Teff (*Eragrostis abyssinica*)," in Kew Bull. Jan. 1887, pp. 2–6—of special interest as being the first subject treated in the Bulletin.——*Eragrostis abyssinica*" (Tropical Fodder-Grasses) in Kew Bull. 1894, pp. 378–380.——"Teff (*Eragrostis abyssinica*)," Burtt-Davy & Sampson, in Transvaal Agric. Journ. iii. April 1905, pp. 536–541.——"Teff," Wentworth-Sykes, in Agric. Journ. Union of S. Africa, i. April 1911, pp. 443–446.——"Teff

(*Eragrostis abyssinica*)," Burtt-Davy, l.c. v. Jan, 1913, pp. 27–37.——" Teff (*Eragrostis abyssinica*)," Burtt-Davy, in Kew Bull. 1913, pp. 32–39.——" Teff Grass (*Eragrostis abyssinica*)," Burtt-Davy, pp. 1–36 (Published by the author, Johannesburg, Sept. 1916).

Eragrostis ciliaris, *Link.*; Fl. Trop. Afr. ined.

Ill.—Jacq. Ic. Pl. Rar. ii. t. 304 (*Poa ciliaris*) Duthie, Fodder Grasses, N. India, t. 38; Wood, Natal Pl. v. t. 428; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 50, f. 17.

Vernac. names.—Olori funfun (Lagos, *Dawodu*); Woawo (Ebute Metta, *Millen*).

Lagos, Opobo, Nupe, Katagum, etc. in Nigeria also in Togoland, Gold Coast, Nyasaland, Rhodesia, Sudan, Somaliland, Tropical America, N. India etc.

Affords good grazing, India (Watt, Dict. Econ. Prod. India); eaten by horses and cattle, Lagos (Dawodu, Herb. Kew).

An annual, tufted, culms 1½-2 ft., common on sandy ground, India (Watt, l.c.), in cultivated ground Nupe (Barter, Herb. Kew) and in sandy loam, river littoral, Burutu (Parsons, Herb. Kew).

Eragrostis gangetica, *Roxb.*; Fl. Trop. Afr. ined.

Ill.—Wood, Natal Pl. v. t. 419.

Vernac. name.—Tsintsiya (Sokoto, *Dalziel*).

Ogurude (Cross River), Opobo, Lokoja, Sokoto, Lake Chad, etc. in Nigeria; also in Sierra Leone, East Africa, and Tropical Asia.

A fodder plant, Sokoto (Dalziel, Herb. Kew); used for thatch and commonly sold for brooms, Hausaland (Dalziel, Hausa, Bot. Voc. p. 96—***Eragrostis sp***; ***biformis*** ?).

A perennial, with culms 1–3 ft. long, in tufts.

Eragrostis megastachya, *Link.*; Fl. Trop. Afr. ined. [*E. Major*, Hochst.].

Ill.—Cav. Ic. i. t. 92 (*Poa Eragrostis*); Sibth. Fl. Gr. t. 73 (*P. Eragrostis*); Host. Gram. Austr. iv. t. 24; Reichb. Ic. Fl. Germ. i. t. 91, f. 1662 (*E. megastachya*); Duthie, Indig. Fodder Gr. N. India, t. 75 (*E. megastachya*); Lisboa, Bombay Grasses, p. 123; Agric. Gaz. N.S. Wales, xxiii. 1912, p. 582: xxix. 1918, p. 781; Hitchcock, Grasses, U. States Dept. Agric. Bull. No. 772, 1920 (*E. cilianensis*).

Vernac. names.—Buddari or Bauderi (Abinsi, Hausa, *Dalziel*); Eran awo (Lagos, *MacGregor*); Ano Yayagan (S. Nigeria, *Dodd*); Harfo (Somaliland, *Drake-Brockman*); Sika Tsuntsua (Nupe, *Barter*).—Stink Grass (N.S. Wales, *Maiden*).

Lagos, Nupe, Aboh, Katagum in Nigeria and throughout Africa, Mediterranean region, and India; introduced as a weed into many countries.

Used more or less as fodder for cattle and horses, India (Watt, Dict. Econ. Prod. India—*E. megastachya*); leaf growth in the early stages very succulent and readily eaten by sheep; but

very unpalatable when the flowers appear, N.S. Wales (Breakwell. Agric. Gaz. N.S. Wales, Nov. 2nd, 1918, p. 781).

An annual, stems 1–2 ft. tufted, with an unpleasant smell—hence the Hausa name in Abinsi (Dalziel, Herb. Kew). This malodorous property, which causes animals to reject it for food requires to be investigated (Maiden, Agric. Gaz. N.S. Wales, July 2nd, 1912, p. 579). The grass promises to become a nuisance (l.c.) and it is a very undesirable plant to have in pastures or fallowed lands, N.S. Wales (Breakwell, l.c.).

Ref.—"Stink Grass (*Eragrostis major*)," Maiden, in Agric. Gaz. N.S. Wales, xxiii. July 2nd, 1912, pp. 577–583; together with some notes on Odoriferous and Poisonous Grasses.

Eragrostis tremula, *Hochst.*; Fl. Trop. Afr. ined.

Ill.—Duthie, Fodder Grasses, N. India, t. 79.

Vernac. names.—[Komaiya (Katagum), Burburwa (Sokoto), *Dalziel*]; Oka esin (Lagos, *Dawodu*); Ogbe agun fon (S. Nigeria, *Dodd*); Berberinoa (Nupe, *Baikie*); Bamburrua (Kontagora, *Dalziel*).

Lagos, Ogurude (Cross River), Nupe, Katagum, Sokoto, Kontagora, etc. in Nigeria and in Afghanistan, India and Burma.

Much used as fodder, Katagum (Dalziel, Herb. Kew), cut for fodder and used as grain in times of scarcity, Sokoto (l.c. & Hausa Bot. Voc. p. 63); affords a scanty substitute for other grains in times of famine Kontagora (Bull. Imp. Inst. 1907, p. 260).

Annual, stems sub-erect, ½–2 ft., a common grass of waste places.

SCHOENFELDIA, Kth.

Schoenfeldia gracilis, *Kunth.*; Fl. Trop. Afr. ined. [*Chloris pallida*, Hook. f., Fl. Br. India, vii. p. 289].

Ill.—Duthie, Fodder Grasses, N. India, t. 64.

Vernac. name.—Shinaki (Sokoto, *Dalziel*).

Sokoto, Katagum etc. in Nigeria; also in India.

Used with other grasses for thatching, Sokoto (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 88).

Annual, very slender, stem 10–18 in. high (Fl. Br. India, l.c. —*Chloris pallida*).

CYNODON, Pers.

Cynodon Dactylon, *Pers.*: Fl. Trop. Afr. ined.

Ill.—Smith & Sowerby, Eng. Bot. t. 850 (*Panicum Dactylon*); Host. Gram. Austr. ii. t. 18 (*P. Dactylon*); Knapp, Gram. Brit. t. 13 (*P. Dactylon*); Reichb. Ic. Fl. Germ. i. t. 26, f. 1404; Kunth, Enum. Pl. Suppl. t. 1; Martius, Fl. Bras. ii. pt. 3, t. 21, f. 3; Syme. Eng. Bot. (ed. 3) t. 1690; Sowerby & Johnson, Grasses, Gt. Britain, t. 142; U.S. Dept. Agric. Rep. Bot. 1878, p. 164, t. 5; 1880, t. 29, f. 5; Vasey, Agric. Grasses (ed. 1) t. 75, (ed 2) t. 59; Symonds, Indian Grasses, tt. 1, 1a, 1b; Duthie, Indig. Fodder Gr. N. India, t. 33; Agric.

Gaz. N.S. Wales, ii. 1891, p. 238, t. 24; Semler, Trop. Agrik. iv. p. 458, f. 151; Year Book, U.S. Dept. Agric. 1894, p. 431; Kearney, U.S. Dept. Agric. Div. Agrost. Bull. No. 1, 1895, p. 9; Lisboa, Bombay Grasses, p. 104; Wood, Natal Pl. v. t. 430; Hitchcock, Grasses, p. 215, f. 46 (*Capriola Dactylon*) and in U.S. Dept. Agric. Bull. No. 772, 1920, p. 178; Bull. Agric. Congo Belge, v. 1914, p. 662; Agric. Gaz. N.S. Wales, xxvi. 1915, p. 1032; Piper, Forage Pl. p. 238, f. 26; Tracy, U.S. Dept. Agric. Farmers' Bull. No. 814, 1917, p. 4, f. 1.

Vernac. names.—Kiri Kiri, Tsirkiar or Tsar-Kiyar Zomo (Sokoto, Hausa, *Dalziel*); Nagil (Arabic, *Broun*); Capim dos caballos "Horse hay" (Loanda, *Welwitsch*); Dub, Khabbal, Talla (India, *Duthie, Watt*).—Bermuda Grass, Bahama Grass, Wire Grass (Virginia), Dogs' Tooth Grass, Indian Couch, Devil's Grass, Quagga Quick (Transvaal); Uganda Grass (Nairobi, *Dowson*, Herb. Kew); Hairy Panick Grass.

Old Calabar, Nupe, Sokoto, and Borgu specimens in Kew Herbarium from Nigeria, but few grasses are so widely distributed over the Tropics and Sub-tropics and this cosmopolitan character is extended to some temperate regions, including the South of England.

An important fodder plant, used for pasture and for hay in the West Indies, United States, Australia, India, etc. In the United States it is stated to be the most important perennial grass in the South (Piper & Tracy *seq.*) and on specimens in the Herbarium at Kew the grass is noted as being used for feeding stock in British East Africa (Kenya Colony), ["Star Grass" (*Cynodon plectostachyum*, Pilger) is also said to be a dominant grass on the East African Plains; it has been established at Pretoria where it promises well and likely to be of importance as a stock-grass (Pole-Evans, letter to Director Kew, dated Pretoria, 6th Feb. 1920)]; in Somaliland, Rhodesia, Unyoro and Mossamedes, a good fodder in Sokoto (Dalziel, Hausa Bot. Voc. p. 63); cattle choose it of all others, Central Africa (Grant, Trans. Linn. Soc. xxix. p. 173). In the West Indies the underground rhizomes are also used for feeding animals.

This is usually regarded as the best grass for lawns in the Tropics, for which purpose it has been used to some extent at Old Calabar, Lagos, Maigana, Kaduna etc. in Nigeria. At Maigana "Dubh" grass planted on an acre of ground in 1913 was reported on in 1914 (Rae, Ann. Rep. Dept. Agric. N. Nigeria, p. 13) as well established, and at Kaduna in 1914 it was reported (l.c. and Kew Bull. 1917, p. 31) that "an area of some 22 acres intended for public gardens was cleared and stumped by hand; the ground was then prepared by means of "Planet-Junior" Cultivators drawn by cattle. It has since been laid down with Doob Grass (*Cynodon Dactylon*), partly from seed and partly with runners obtained from a plot established at Maigana in 1913. The result is very gratifying, a fair turf having been obtained in less than a year." It is also being grown in Uganda

for lawns (Fyffe, Ann. Rep. Bot. & Foresty Dept. Uganda, 1915, p. 4). Many more instances of its use for both forage and lawns might be enumerated; but the value of the grass will be sufficiently evident without.

The rhizomes of this grass are used in medicine as a substitute for those of "Couch" (*Agropyron repens*) the plant officially recognised in the British Pharmacopoeia, and there are specimens in the Kew Museum of a consignment to the London Drug Market from Spain, valued (June, 1916) at 50*s*. per cwt.

The plant is a perennial from a few inches to 2 ft. or more high; a height of 3 ft. in Somaliland is recorded on a specimen (Appleton, 1903) in the Kew Herbarium and the stolons reach 10–12 ft. Angola (Hiern, Cat. Welw. Afr. Pl. ii. p. 220). Tracy (U.S. Dept. Agric. Farmer's Bull. No. 814, 1917, p. 7) recommends for fodder, "Giant Bermuda"—"often makes runners 20 ft. or more in length, with an abundance of erect stems 2 ft. or more in height, affording 2–3 annual cuttings and yielding more than any other variety, yet tested"—and as the best for lawns the variety "St. Lucie"—"seldom more than 6 in. in height, with slender stems and small leaves."

It is readily propagated either by seeds or by division of the rhizomes; seed may be sown broadcast, 5 lb. per acre (Tracy, l.c. p. 9); 50 or 60 lb. (for lawns) per acre (Davies, Dept. Agric. Agra & Oudh Bull. No. 39, 1916, p. 5) and pieces of the rooting stems may be planted about 8 in. apart, this covering the ground in about 6 weeks if done at the beginning of the rainy season Kew Bull. 1894, p. 377). A common practice in the United States is to plant fresh pieces of sod, about an inch in thickness, 2–3 ft. apart in furrows 4–6 ft. apart or on ploughed fields, the pieces may be dropped 2–3 ft. apart and pushed into the soil with a forked stick such as is used in planting sweet potatoes, then trod in firmly (Tracy, l.c.). Soil appears to be of secondary consideration, provided it is open and moderately rich; a good rainfall encourages free growth, but the plant stands drought well. The yield may vary according to conditions, but from 2–5 tons of hay would be considered good, and when pastured one cow per acre may be supported. The feeding value is regarded as equal to that of "Timothy" (*Pheleum pratense*) for work mules and dairy cows (Piper, Forage Pl. p. 243). In spite, however, of the strong recommendation for good, it is also a power for evil (hence the name "Devil's Grass") and is often condemned as a noxious weed on arable land. It is recorded as "a terrible pest in plantations of cotton etc." and too plentiful among crops of mandioca and maize in Angola (Hiern, Cat. Welw. Afr. Pl. ii. p. 221).

Ref.—*Cynodon Dactylon*: "Creeping Panic Grass or Doorwa," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 678–681.—— "*Cynodon Dactylon*," in Kew Bull. 1894, pp. 377–378.——The Making and Care of Lawns in India, Howard, Agric. Research Institute, Pusa, Bull. No. 12. 1908, pp. 1–3.——"*Cynodon*

Dactylon " (" De la Nécessité d'Améliorer les Pâturages Naturels et le Bétail du Congo "), Leplae, in Bull. Agric. Congo Belge, v. Dec. 1914, pp. 661–663.——" Bermuda Grass (*Cynodon Dactylon* "), in Forage Plants and their Culture, Piper, pp. 237–244 (The Macmillan Co. New York, 1915).——" Turf," in Agric. News, Barbados, xiv. Jan. 30th, 1915, p. 47.——Notes on Lawns, Davies, Dept. of Land Records and Agric., U. Prov. and Oudh, India, Bull. No. 39, 1916, pp. 1–10.——Bermuda Grass, Tracy, U.S. Dept. Agric. Farmers' Bull. No. 814, 1917, pp. 1–19.

Chloris, Swartz.

Chloris Gayana, *Kunth*; Fl. Trop. Afr. ined.

Ill.—Kunth, Rév. Gram. ii. t. 58; Wood, Natal Pl. v. t. 437; Transvaal Agric. Journ. iv. 1905–06, t. 8; Agric. Gaz. N.S. Wales, xvii. 1906, t. 437, xix. 1908, p. 118 (4 months after sowing), xxvi. 1915, p. 1033; Thonner, Blütenpfl. Afr. t. 8; Bull. Soc. Nat. d'Accl. France, 1919, t. 3; Tracy, U.S. Dept. Agric. Farmers' Bull. No. 1048, 1919, p. 4, f. 1 (plant showing running prostate stems), p. 13, f. 3 (Head and enlarged spikes & spikelets).

Vernac. names.—Rhodes Grass, Capim de Rhodes.

Senegal, Eritrea and other parts of Tropical Africa; but better known from the Transvaal, Natal, Cape Colony etc. in S. Africa. Introduced to Australia, Philippine Islands, S. United States, West Indies, Sicily and Algeria.

A fodder plant, valuable for hay and summer pasturage (Transvaal Agric. Journ. iv. t. 8), as a meadow grass in the S.U. States (Hitchcock, Grasses, (1914) p. 216), for cut feed and for hay in Texas it has become almost the universal practice to have one or more acres of it for a feed and pasture lot near the stable on every farm and ranch (Tracy, U.S. Dept. Agric. Farmers' Bull. No. 1048, 1919), found in every way equal to " Timothy "—*Phleum pratense* (Philippine Agric. Rev. v. 1912 p. xxii).

A perennial, 3–5 ft. high, thrives in warm countries, with a moderate rainfall; but stands drought well; a good loamy soil is required though, it is reported (Queensland Agric. Journ. xxvi. April 1911 p. 164; Agric. News, Barbados, March 14, 1914, p. 85) this may be less rich than that required for *Paspalum dilatatum, q.v.*); and mixed with this grass (proportion of ½) it has been sown at the rate of 2 lb. of seed per acre—the seed germinates and grows quickly and the crop is easily made into hay (l.c.). Sown alone 7–8 lb. per acre, broadcast—or 2–3 lb. per acre, where a press drill is used, is considered sufficient. Continuous moisture is essential for 6–8 weeks, or until the young plants are well established; under favourable conditions, grazing may be started in a month after seeding and frequently a fair cutting for hay in two months may be obtained; cuttings are recommended as soon as the seeds begin to ripen and in arid

regions irrigation is necessary after each cutting, from 3–6 of which may usually be made during the year, about 5 weeks being considered sufficient for the development of a hay crop. Curing is recommended to be done as quickly as possible in order to keep the hay of a good colour. The yield of hay on favourable moist soils is given at 8 tons or more or under dry conditions and in poorer soil 1–2 tons per acre. Nearly all the Rhodes Grass seed harvested in the United States is gathered from about baling presses, barn floors and other places where the hay has been handled; it has so far not been found practicable to harvest seeds by thrashing or stripping as the ripening is more or less continuous and uneven throughout the year; from 20–50 lb. per ton may be obtained in this way, and unless cleaned, allowance must be made for the chaff and trash contained in it when sowing (Tracy, l.c.).

There appears to be no record of this grass being grown in Nigeria; but the evidence of its value is strongly in favour of a trial, particularly so, as other species of *Chloris* are known to occur wild.

Ref.—Rhodes Grass (*Chloris Gayana*), "Maiden, in Agric. Gaz. N.S. Wales, xvii. Dec. 3rd, 1906, pp. 1206–1211.——"Rhodes Grass" (Forage Plants) in Philippine Agric. Rev. v. 1912, pp. xxii–xxiii.——"Rhodes Grass and Its Introduction into the West Indies," xiii. March 14th, 1914, p. 85.——"Une Nouvelle Plante Fourragère pour les pays Sub-tropicaux, Le *Chloris Gayana*," Misson, in Bull. Soc. Nat. d'Accl. de France (Revue des Sciences Nat. Appliquées) lxvi. Jan. 1919, pp. 17–27. ——Rhodes Grass, Tracy, U.S. Dept. Agric. Farmers' Bull. No. 1048, 1919, pp. 1–14.

Chloris robusta, *Stapf*; Fl Trop Afr. ined.

Vernac. name.—Kasara (Sokoto, *Dalziel*).

Yola, Sokoto, Borgu, Congo region &c.

A perennial, ornamental, 5 ft. high, Borgu (Barter, Herb. Kew), a tall grass of river beds, Sokoto and Yola (Dalziel, Herb. Kew).

Chloris virgata, *Swartz*; Fl. Trop. Afr. ined.

Ill.—Jacq. Eclogae Gram. t. 9 (*C. polydactyla*); Transvaal Agric. Journ. iv. 1905–06, t. 9; Wood, Natal Pl. v. t. 436; Agric. Gaz. N.S. Wales, xvii. 1906, p. 1208, t. 436; Notizbl. Bot. Gart. Berlin, No. 46, Feb. 5th, 1910, p. 144; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 190, f. 112.

Vernac. names.—Kafar fakara or Kafar gauraka (Sokoto, Hausa, *Dalziel*).—Sweet Grass or Zoet Grass (Transvaal, *Burtt-Davy*).

Katagum, Ogurude, Transvaal, Natal etc. in Africa and in India, Burma and China.

A fodder plant, largely used for hay in the Transvaal considered highly nutritious and keenly relished by stock; baled "Sweet Grass" hay is sold largely in the markets of Pretoria and Johannesburg (Kew Bull. 1911, p. 160); the favourite veld

hay, Transvaal (Burtt-Davy, Transv. Agric. Journ. iii. Jan. 1905, p. 290).

An annual weed in old lands (l.c.) commonly found on old maize lands, Transvaal (Burtt-Davy, Transvaal Agric. Journ. 1905–06, t. 9); abundant in bush, Katagum (Dalziel, Herb. Kew); invades cultivated fields and sometimes becomes a common weed, especially in "alfalfa" (*Medicago sativa, see* p. 186) fields, South Western United States (Hitchcock, l.c. p. 189).

CTENIUM, Panz.

Ctenium elegans, *Kunth*; Fl. Trop. Afr. ined.

Vernac. names.—Shinaka, Wutsiar or Wutsiyar Kusa (Sokoto, Hausa, *Dalziel*).

Lagos, Abbeokuta, Katagum, Sokoto, Borgu etc. in Nigeria; also in Sierra Leone and other parts of Tropical Africa.

Used for thatching, Sokoto (Dalziel, Hausa Bot. Voc. p. 88); pulp suitable for paper-making (Bull. Imp. Inst. 1921, p. 281).

A perennial, about 6 ft. high in open plains, Borgu (Barter, Herb. Kew), about 2 ft. high, Sokoto; a roadside weed, Katagum (Dalziel, Hausa Bot. Voc. p. 88; Herb. Kew); a very elegant widely caespitose grass, culms 2–3 ft. or higher, plentiful in rather damp meadows on the banks of the river Cuanza, Pungo Andongo, Angola (Hiern, Cat. Welw. Afr. Pl. ii. p. 221).

ELEUSINE, Gaertn.

Eleusine coracana, *Gaertn.*; Fl. Trop. Afr. ined.

Ill.—Trinius, Sp. Gram. Ic. i. t. 70; Lam. Encycl. t. 48, f. 1; Duthie, Field Crops, t. 28; Church, Food Grains, India, p. 88; Symonds, Indian Grasses, t. 5; Lisboa, Bombay Grasses, p. 109; Wood, Natal Pl. t. 5; Barber, Inter. Sugar Journ. Dec. 1920, p. 684.

Vernac. names.—Tamba (Katagum, *Dalziel*); Uimbe (Zanzibar, Bull, Imp. Inst. 1914, p. 340); Dokhn (Hadramaut, *Lunt*); Talban (Abyssinia, Col. Rep. Misc. No. 71, 1910, p. 212); Marumbi (Zambesi, *Scott*); Telebun (Africa, *Junker*); Dagussa (Eritrea, *Baldrati*); Mitchinin (Zambesi, *Kirk*); Tomba (N. Nigeria, *Dudgeon*); Lūcu or Luco (Golungo Alto, *Welwitsch*); Ragi (India, *Watt*); Bolu (Unyoro, *Dawe*); Upoko (Natal, *Wood*); Ooleyzei (Nile, *Speke* & *Grant*); Nagli (Bombay, *Fletcher*).—Tamba Millet (N. Nigeria), Ginger Millet.

Nigeria, also in Rhodesia, Arabia, Natal, India, etc.

Grain an important food, but sometimes only regarded as a famine food in India, where the straw is also used for fodder; cultivated as food for cattle, Hadramaut (Lunt, Herb. Kew); Ragee flour is used in Malaya for food—increased use recommended to meet the growing shortage of rice (Journ. Roy. Soc. Arts, Oct. 1st, 1910, p. 733); cultivated everywhere for making an African beer (Garapa) from the seeds, Golungo Alto (Hiern,

Cat. Welw. Afr. Pl. ii. p. 224); used in the manufacture of beer Eritrea (Agric. Col. Italy, v. March 1911, pp. 100-113); for distilling into Pombe beer, Zambesi (Scott, Herb. Kew); as a cereal and for making beer (Wood, Herb. Kew); a food grain in N. Nigeria (Dudgeon, Agric. & For. Prod. W. Africa, p. 149: Dalziel, Hausa Bot. Voc. p. 91 and Herb. Kew—specimen from Katagum); mixed with other grains forms the principal food Luabo District, Zambesi (Kirk, Herb. Kew); a food grain in Abyssinia (Col. Rep. Misc. No. 71, 1910, p. 212). Samples of the grain have been submitted to brokers in London; but there is no market for it here, although given a probable value of £4 10*s*. per ton (March 1906)—and suggested for cattle food; but owing to the small proportion of albuminoids it was considered of low value as a food-stuff (Bull. Imp. Inst. 1909, p. 151).

From the whole meal of this grain a dark-chocolate coloured porridge and "Kisra" of like appearance is made, Africa (Junker, Travels in Africa—1879-1883—Keane transl. p. 272).

An annual, 2-5 ft. high; or stated to grow to a height of 2 ft. 6 in., Nigeria (Imp. Inst. No. 30471, specimens in Herb. Kew), very like *E. indica*; but more robust, up to 5 ft. high (Fl. Cap. vii. p. 645). In South India seedlings are raised in nurseries and transplanted to land kept constantly moist, about 2 lb. of seed will plant an acre (seeds very small—157,500 to the lb.) The yield is 2000-3000 lb. of grain and about 8,000 lb. of straw per acre (Barber, *seq.* p. 685). Cultivated everywhere by the natives of the African interior for the grain, sometimes in ridges with Indian corn and at other times, as in the Himalayas, broadcast (Grant, Trans. Linn. Soc. xxix. p. 174).

Ref.—"*Eleusine coracana*, the Marua or Ragi Millet," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 237-241.——"Tamba Millet from N. Nigeria and Bolu Grain from Uganda," Bull. Imp. Inst. vii. 1909, pp. 150-151.——"Report on Tamba Millet," N. Nigeria Gazette, Nov. 30th, 1909, p. 252.——"Bolu," Col. Rep. Misc. No. 64, 1909, Uganda, pp. 11-12, with analysis.——"Uimbe (*Eleusine coracana*)." Bull. Imp. Inst. xii. 1914, p. 340, from Zanzibar, with analysis.——"Ragi (*Eleusine coracana*)," Barber, in The International Sugar Journ. xxii. Dec. 1920 ("Millets for Fodder on Sugar Estates") pp. 685-686.

Eleusine indica, *Gaertn.*; Fl. Trop. Afr. ined.

Ill.—Trinius, Sp. Gram. Ic. i. t. 71; Lam. Encycl. t. 48, f. 3; Kunth, Enum. Grass. Suppl. t. 16, f. 4; Duthie, Fodder-Grasses N. India, t. 69; Vasey, Agric. Grasses (1884 ed.) t. 79, (1889 ed.) t. 64; U.S. Dept. Agric. Div. Agrost. i. 1895, p. 10; Rep. 1878, p. 166, t. 6; 1880 t. 29, f. 6; Wood, Natal Pl. v. t. 439; Brown & Hunter Pl. Uganda, p. 79; Hitchcock, Grasses, U.S. Dept. Agric. Bull. 772, 1920, p. 176, f. 103.

Vernac. names.—Tuji, Chiyawar Tuji (Katagum, *Dalziel*) Ese-Kana-Kana (Lagos, *Dawodu*); Gbegi (Lagos, *MacGregor, Dodd*); Kasibanti (Uganda, *Brown & Hunter*); Pé de galinha

(Golungo Alto, *Welwitsch*); Wild Rapoko Grass (S. Africa, *Appleton*); Osoekurunyi (Sierra Leone, *Thomas*); Goose Grass Yard Grass (U. States, *Hitchcock*).

Lagos, Opobo, Nupe, Katagum, etc. in Nigeria; in S. Africa and Tropics of the Old and New Worlds.

Eaten by horses, Lagos (Dawodu, Herb. Kew); a good fodder and capable of being used as food, Hausaland (Dalziel, Hausa Bot. Voc. p. 97); good pasturage in old lands, Buluwayo and Matoppo Hills (Appleton, Herb. Kew), the best grass—though remarkably strong and tough—for grazing purposes, Unyanwesi District (Speke & Grant, Herb. Kew; Trans. Linn. Soc. xxix. p. 174), and the most liked by cattle of all the grasses of Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 224).

An annual, 1½ ft., Mupe (Barter, Herb. Kew); culms a few inches to 2 ft. (Fl. Cap. vii. p. 645).

Dactyloctenium, Willd.

Dactyloctenium aegyptiacum, *Willd.*; Fl. Trop. Afr. ined.

Ill.—Beauvois, Agrost. t. 15, f. 2; Trinius, Sp. Gram. Ic. i. t. 69 (*D. mucronatum*); Lam. Encycl. t. 48, f. 2; Kearney, U.S. Dept. Agric. Div. Agrost. Bull. No. i. 1895, p. 11; Wood, Natal Pl. v. t. 441; Transvaal Agric. Journ. vi. 1907–08, t. 75; Notizbl. Bot. Gart. Berlin, v. No. 46, 5th Feb. 1910, p. 146, f. 7; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 177, f. 104.

Vernac. names.—Gude gude (Hausa. *Dalziel*); Inane (Natal, *Wood*); Natal or Egyptian Kweek-Grass (Transvaal, Agric. Journ. l.c.); Little Crowfoot (U. States, *Kearney*); Comb Fringe Grass (*Dalziel*); Crowfoot Grass (U. States, *Hitchcock*).

Lokoja, Nupe, etc. in Nigeria, also known from Sierra Leone, Gold Coast, Chari Central, Tanganyika Colony (G.E. Africa), Transvaal, Natal and widely spread in tropical and sub-tropical regions.

Seed eaten by poorer classes in India, where the grass is also generally considered a very nutritious fodder for cattle (Dict. Econ. Prod. India—*Eleusine aegyptiaca*); a good horse fodder Hausaland (Dalziel, Hausa Bot. Voc. p. 42); a forage plant preferred by cattle, W. Africa (Chevalier, Journ. d'Agric. Trop. 1911, p. 97; Bull. Bur. Agric. Int. Rome, June 1911, p. 1318); liked by stock (Wood, Natal Pl. t. 441); valued as a fodder on account of its high milk-yielding properties and in times of famine the grain is used for human food, German East Africa (Der Pflanzer, 1911, p. 667; Bull. Imp. Inst. 1912, p. 146) "The poorer starved people gather the ears of this grass, dry them in the sun, beat out the grain (extremely small) on surface rocks, grind it and make the flour into stirabout eaten with mushrooms" in Unyanyembe, Central Africa (Grant, Trans. Linn. Soc. xxix. p. 173). Used for making lawns in Natal (Wood, l.c.).

An annual 1–1½ ft. high, stems sometimes prostrate, rooting at the nodes; found about towns and villages, Nupe (Barter, Herb. Kew), growth very rapid and thrives well on poor soils (Chevalier, l.c.) Dense crops of it grow in waste ground and upon the flat roofs of the Arabs houses in Unyanyembe (Grant, l.c.); forming very elegant meadows, everywhere in damp places Loanda (Hiern, l.c.).

Dactyloctenium glaucophyllum, Court. "Jaddoho" or "Dojo" of Somaliland, also in Nubia and Panjab, is said to be eaten greedily by cattle and sheep; but it is dangerous for horses, causing intense irritation of the bladder and kidneys if eaten in large quantities (Appleton Herb. Kew; and Bull. 1907, p. 222).

ORYZA, Linn.

Oryza sativa, *Linn.*; **Fl. Trop. Afr.** ined.

Ill.—Bentley & Trimen, Med. Pl. t. 291; Duthie, Field Crops, t. 4; Church, Food Grains, India, pp. 67, 71; Koehler, Med. Pflan. iii.; Agric. Journ. India, 1919, tt. 12, 13; Hitchcock, Grasses, U.S. Dept. Agric. Bull. No. 772, 1920, p. 205, f. 122; and numerous other works.

Vernac. names.—Shinkafa (Hausa, *Dalziel, Dudgeon*).—Rice.

Cultivated throughout the Tropics and in many Sub-Tropical countries.

The commerical sources of the grain are chiefly British India, Siam, Java, Straits Settlements, Spain, Italy, Egypt, Japan, French Indo-China, United States, etc; important trade descriptions being "Patna," "Rangoon," "Siam Garden," "Java," "Carolina," "Japan" and "Japanese Unpolished."

The grain is a well-known food product, probably the greatest in the world. A great part of the rice sold for food is "white" or "polished," that is with the thin outer covering—the more nutritious part of the grain—removed; and where the use of this is supplemented by a variety of other foods the constituents lost are not likely to be missed; but in countries where rice is the staple food it is of importance that the whole grain be eaten; it has been found that those who consume rice parboiled before husking or when prepared by primitive methods of pounding and winnowing are free from the disease "beri-beri." In Lower Bengal the preliminary treatment of the grain for food consists of soaking the paddy (unhusked rice) in cold water for 24–36 hours. "It is then removed in a large earthen pot 'handy' and boiled with a little water—about half a seer (2 lb.) in a 'handy' containing about 10 seers of paddy—until some of the grains burst, the grains are then dried in the sun over a mat until the grains inside the husks become hard when the husks are removed by a wooden machine called a 'dheky'" (Kew Bull. 1909, p. 229).

[*See* Essay on Beri-Beri in Japan [transl. F. v. Mueller] by A. Wernick (Australian Medical Journ. 1882); "The Etiology of

Beri-Beri," by H. Fraser, M.D. & H. T. Stanton, M.D., Institute for Medical Research, Fed. Malay States, pp. 1–89; pls. i.–iii. (Kelly & Walsh, Ltd. Singapore). "Padi," L. A. Boodle in Kew Bull. 1909, pp. 277–279—an examination of the rice samples made at the Jodrell Laboratory, Kew, in the course of the Investigations for the Medical Research Paper above. "Padi and Its Relations to Beri-Beri," in Agric. Bull. Fed. Malay States, viii. Oct. 1909, pp. 472–474 (from Kew Bull. l.c.). Report from the Institute for Medical Research, F.M.S., for the period from Oct. 1st, 1909, to March 31st, 1910—reprint in Govt. Gaz. Nigeria, June 21st, 1911, Suppl. pp. 1–8. "On the Chemical Composition of Polished Rice," by Teizo Takakashi & Hisae Sato in Journ. Coll. Agric. University of Tokyo, v. No. 2, March 1913, pp. 135–152.]

It has been estimated in the milling that 40 parts of padi produce 25 parts of white rice, 5 parts of polishings and 10 parts of husk; the polishings are sold as food for cattle and the husks are burned as fuel in the mills in Singapore (l.c. p. 3); they are also known as "rice bran," included with the term "rice meal" on which drawback of duty is allowed when produced in the process of cleaning imported uncleaned rice in Australia (Bd. of Trade Journ. Sept. 30th, 1909, p. 669), and about 18½ lb. of rice bran is obtained in the cleaning of 100 lb. of rough rice (Agric. News, Barbados, Sept. 4th, 1909, p. 277). "Sugar Meal" is a name given to a mixture of rice bran, an inferior sugar and crushed cotton seed that has been used for feeding to stock in Barbados (l.c.). An average sample of rice meal contains about 10 per cent. of albuminoids, 7·3 per cent. of oil and 63·3 per cent. of carbohydrates and for feeding purposes it is advisable to add a small quantity of food rich in albuminous or flesh-forming constituents such as cotton-seed meal or pea or bean meal (l.c. June 13th, 1908, p. 184).

Rice straw is a good fodder for stock; it contains 4·72 per cent. crude protein, 32·21 per cent. carbohydrates and 1·87 per cent. fats, and when well preserved the sweetness and excellent flavour adds very materially to its practical feeding value (Knapp, U.S. Dept. Agric. Farmers' Bull. No. 110, 1900, p. 24). In Sherbro, Sierra Leone, the rice-straw, after the grains are drawn out by hand, is used for brooms, and also with other things in the preparation of a potash called "lubi" used in the manufacture of country black soap (Alldridge, The Sherbro and Its Hinterland, p. 95).

Industrial or Power Alcohol from Rice Straw has been suggested in rice-growing countries where the raw material is available in sufficiently large quantities (Simmonds, Nature, Oct. 21st, 1921, p. 245; Agric. News, Barbados, Dec. 11th, 1920, p. 393), as well as from the grain—the source of "Arrack" in India, "Samsha" in Hong Kong, &c.—which yields approximately the very high percentage of 78 fermentable matter (Kew Bull. 1912, p. 122).

Rice from Ilorin Province N. Nigeria—partially cleaned, fairly large grains of rather a dark colour was reported upon in London (Dec. 1907) as equal in quality to Bengal rice and worth about 9*s*. 6*d*. per cwt. quay terms; it could not be exported at a profit unless the estimated price in Nigeria and the cost of freight are capable of great reduction (Col. Rep. Misc. No. 71, 1910, p. 211). The present price (April 1921) of "Rangoon" rice in London and Liverpool is 16*s*. 6*d*. per cwt. (Rayner & Co. Weekly Report, 11th April 1921), and average prices in London are "Rangoon," 17*s*.; "Carolina," 35*s*.; "Japanese," 28*s*.; "Patna," 38*s*.; and "Siam (polished), 30*s*. per cwt. (Times Trade Suppl. May 28th, 1921). A considerable amount of rice is annually imported into Nigeria; for the half year ending June 30th, 1913, there were 83,585 cwt. value £50,693 imported (Nig. Customs & Trade Journ. Aug. 18th, 1913, p. 472); or during the whole year (1913), 99,671 cwt. value £55,027, consigned from home (Trade of the United Kingdom, iii. 1921, p. 2), this being more than to any other Colony.

In Nigeria rice is cultivated in Kontagora in some low-lying meadows, in marshes and near streams; but the careful culture as practised in the East is said to be unknown in the Province (Dalziel, Bull. Imp. Inst. 1907, p. 260); cultivated in Yola; but it has been suggested that here the cultivation might be greatly extended especially near the Benue River (Dalziel, Kew Bull. 1910, p. 140). A sample of grain from the Ilorin Province was valued in London (Nov. 1907) at 9*s*. 6*d*. per cwt. quay terms, and considered about equal to Bengal rice; it was described as consisting of large, partially cleaned rather dark-coloured grains; but the local price was then too high to admit of export (Bull. Imp. Inst. 1909, p. 149) and another sample (unhusked) from Nigeria, submitted to brokers was reported on "as difficult to value as rice in the husk does not find any market in Europe, and being of the red-grained variety would, even when husked, be almost useless in the United Kingdom, except for feeding poultry" (Govt. Gaz. N. Nigeria, April 30th, 1910, p. 93). The local value (Feb. 1913) of 550 lb. of rice, the produce of 2 acres of land was at 1*s*. for 50 lb. equal to 11*s*., the profit being put at 9*s*. 7*d*.—on a farm in Sokoto, 71½ lb. being used for sowing the 2 acres (Malcolm, N. Nig. Gaz. May 15, 1913, Suppl. p.185). On the banks of the Kaduna River, near Dakman and Dakomba, along the Baku river from Katcha to Badeggi and at several places on the Niger, the low land is put under rice; in the Gwari country very little appears to be grown; but in the Zaria and Kano districts the crop is planted wherever low swampy land occurs and near Zaria the seed is sown after the ground has become saturated and the crop is harvested after about six months; all the rice appears to be of the same type—one which would be called in India "baggra" or red rice, and the so-called "Nupe" rice of red appearance, may be taken as a type of that grown throughout the country (Dudgeon, N. Nig. Gaz.

July 31st, 1909, p. 156). On the farm at Oloke Meji 1906 seven Sierra Leone rices were tried (Col. Rep. Misc. No. 59, 1908, p. 43) and in 1907 four varieties found to give the best results were being grown to obtain seed for distribution (Foster, Rep. Agric. W. Prov. July 1907; S. Nig. Gaz. Suppl. Oct. 30th, 1907).

There are many varieties under cultivation, including lowland and upland forms, sometimes classified under these heads or according to whether the grain is glutinous or non-glutinous or on the period of ripening early, medium, or late; all annual plants 1–6 ft. high and upwards, coming to maturity in from 4–5 months from sowing the seeds [for classification *see* the works by Watt (India) and Kikkawa (Japan) mentioned below]. The two types of Rice chiefly grown in the United States on the Gulf coastal plains are "Honduras"—seed long and narrow averaging in length 2½ seeds and in width 8 seeds to an inch, plant erect averaging 50 in. in height, with up to 4 stalks per plant, showing in tendency to lodge except on rich soil and strong enough to withstand wind and rain-storms, matures in about 128 days and yielding about 1996 lb. of paddy or rough rice per acre; "Japanese"—seed short and rounded; the "Wataribune" variety is described as averaging 4 seeds in length and 7 seeds in width to an inch, plant of spreading habit, averaging 39 in. in height, with stalks up to 9 per plant, and has on account of the spreading habit and heavy heads a tendency to lodge, especially in rich soil; matures in about 137 days and yields an average of 2600 lb. per acre. "Blue Rose" is a medium grain rice, averaging 44 in. in height, stalks large and stiff, up to 13 per plant, maturing within 142 days and yielding an average of 2500 lb. per acre; it is never recommended for rich soil; but makes (unlike "Wataribune") very low yields on poor soil; the leaves are green when the grain is ripe enough to be harvested (Wise & Broomwell, *seq.*; Chambliss, U.S. Dept Agric. Farmers' Bull. 1092, 1920, pp. 8–11). In Sierra Leone, both swamp and upland rice—most of it of a red colour and of little value on the European market—is grown (Bull. Imp. Inst. 1914, p. 105). The white rice known in Sierra Leone as "American rice"—"reputed to have been introduced by the early American Missionaries from the United States," but there are several kinds of country rice some of which are of a reddish colour (Alldridge, Sierra Leone, *seq.* pp. 342, 347).

The methods of cultivation may vary somewhat in different countries, but in general up to a certain point, the preparation of the soil, sowing and harvesting is much the same as for other grain, as corn, wheat or sorghum; a tropical climate and, where flooding is not practised, a good rainfall, and a good loam, with a hard subsoil 12–15 in. or so below the surface are favourable conditions for cultivation. The flooding and subsequent drainage of the fields is of importance, requiring considerable engineering skill to regulate the depth of water and the right periods for drying off the land. On the rice-prairies of the United States,

where over a million acres are grown the water is obtained mostly from streams and wells, distributed by canals, the pumping and distribution from the streams being run by private companies. Deep wells and pumping machinery also form part of the equipment of some farms (Chambliss, l.c. p. 6; *see also* Cons. Rep. Misc. No. 625, 1905).

The seed may be drilled in rows a foot to 15 in. apart, sown broadcast or raised in nurseries and planted out 8-9 in. apart. Upwards of 80 lb. of seed is estimated to sow an acre (ll.cc.) a few pounds more or less may be required according to variety and quality and soil. Broadcast or drilled rice in India requires 80–120 lb. of seed per acre and to raise seedlings for transplanting 30–80 lb. of seed per acre is usual (Watt, Comm. Prod. India, p. 826). It is advisable to have the plants close enough to prevent tillering. In the Federated Malay States "Padi" is grown on wet or swampy land, plough land, and hill land. On the first the rice is planted annually—the seed is sown in a nursery and the seedlings planted out, when about 40 days old, in bunches of 3 or 4 at distances of from 1–2 ft. apart; the crops ripen in from 7–9 months and the yield may be from 35–70 bus. per acre. On the second, for 3–5 years in succession followed by a period of about the same lying fallow after the land has been well ploughed, the seed is sown broadcast, the crop ripens in 5–7 months giving a yield of from 25–35 bus. per acre and for "Hill Padi," on freshly cleared land the seed is sown several at a time in holes made with a pointed stick, about 1 ft. apart the crop ripening and yielding approximately the same as on plough land (Wise, Agric. Bull. Str. & Fed. Malay St. i. 1902, pp. 13–19).

The "American" rice in Sierra Leone is grown in wet-land right down to the water side and when 12–15 in. high the women transplant it in little clumps; this swamp-grown rice comes in early during the dry season, and is carefully stored (in April and May) for local consumption during the rainy season (middle of May until November) when the larger crops on higher ground are growing, the cultivation of which appears to be much the same as that for cotton and Guinea Corn with which it is sometimes sown. After the seed is well above ground, or about a month later, weeding begins and in the second month when the ears are filling out for ripening, protection from birds—which began in the early seed stage—is necessary until the rice is harvested. When the American rice above mentioned, is in the ear it is not attacked by the small rice-birds as the grain is too large and heavily set for their beaks; but in the fields of native rice when the grain is forming "these destructive little creatures play havoc with the crops and all over the fields may be seen rough wooden stages on which a child, perhaps a small girl in charge of a pickin [baby] scares off the birds with slings and stones" (Alldridge, Sierra Leone, *seq.* and The Sherbro, *seq.*). Scott Elliot describes (Col. Rep. Misc. No. 3, 1893, p. 41) much

the same methods in this Colony—first "in the stretches of alluvium common beside rivers and streams, and usually overflowed in the wet season—yield by this method varying from 1600–3600 kilos per acre; the cultivation in these places is carried on in the ordinary Indian and Burmese manner except that it is of a much rougher and simpler kind; second, in the higher valleys of the Limba country where the natives occasionally cut down large stretches of forest which are burnt on the spot before the rainy season begins; the rice is sown on the dry ash-covered grounds and springs up during the rains."

Of the innumerable varieties cultivated in India where rice is a staple crop in all areas of heavy and assured rainfall and good crops are also obtained in other areas assisted by irrigation, those of Bengal are referred to three classes:—the "Aman," or winter crop, sown on lowlands in May or June and reaped in December or January, and by far the most important crop; the "Aus" or "Bhadoi," the autumn or early rice crop, sown in April or May on comparatively high land and reaped in August or September, and "Boro," or summer rice, sown in swamps in January or February and reaped in April or May (Watt Comm. Prod. India, p. 828). The yield in different tracts, from different soils and from different methods of cultivation varies very greatly. In good soil an average transplanted crop yields about 2400 lb. of paddy per acre in a favourable season; broadcast and drilled rice yield much less (l.c. p. 827). The varieties grown in India differ in size, shape, weight, colour, consistence and properties and the names attributed to them is on account of their supposed qualities (Hooper, Agric. Ledger, No. 5, 1908–09, p. 63) and after an examination of 159 named samples of grain it has been found that "the richness of the grain appears to be due not so much to the races of the plant or the appearance of the grain as to the cultivation; the grains of finest composition are found in plants grown in rich virgin soil or in lands liberally manured" (l.c. p. 91).

Ref.—"*Oryza sativa*," in Field & Garden Crops, N.W. Prov. & Oudh, Duthie & Fuller, pp. 15–20 (Thomason Civil Engineering College Press, Roorkee, 1882).——"*Oryza sativa*," in Dict. Econ. Prod. India, v. part 2, 1891, pp. 502–654.——"Black Burmese Rice," in Kew Bull. 1892, pp. 232–234.——The Present Status of Rice Culture in the United States, Knapp, U.S. Dept. Agric., Div. of Botany Bull. No. 22, 1899, pp. 1–56.——Rice Culture in the United States, Knapp, U.S. Dept. Agric. Farmers' Bull. No. 110, 1900, pp. 1–28.——"Rice (Mendi, Beh), in The Sherbro and Its Hinterland, Alldridge pp. 92–95 (Macmillan & Co. Ltd. London, 1901)."——"Note sur la Culture du Riz dans le Haut-Oubangi," Michot, in L'Agric. prat. pays chauds, i. 1901–02, pp. 123–128.——"Essai de Decortication du Riz de la Guinée Française," Ringelmann, l.c. pp. 286–292, with particulars of machinery.——"Report on the System of Rice Cultivation practised in Pahang," Wise, in Agric. Bull.

Straits & Fed. Malay States, i. 1902, pp. 13–19.——Modern Rice Culture, Boudreau, Philippine Bureau of Agric., Farmers' Bull. No. 3, 1904, pp. 1–23—also in Spanish "Metodos Modernos del Cultivo del Arroz."——Report on the Rice Industry in the United States, Seymour Bell, Consular Report, Misc. Series No. 625, 1905, pp. 1–26.——Rice (*Oryza sativa*), Dept. Agric. Nairobi, B.E. Africa (Kenya Colony), Pamphlet No. 25, March 1907, pp. 1–8 from Text-book of Trop. Agric. Nicholls pp. 265–271.——"Rice Cultivation in Lower Burma," McKerrat, in Agric. Journ. India, iii. Oct. 1908, pp. 357–365, pls. 48–52.——"*Oryza*" in the Commercial Products of India, Watt, pp. 823–842 (John Murray, London, 1908).——"The Composition of Indian Rice," Hooper, in Agric. Ledger, No. 5, 1908–09, pp. 63–109.——"Riz" (Notes sur Pl. Largement Cult. par les Indig. en Afr. Trop), De Wildeman, in Ann. Mus. Col. Marseille, vii. 1909, pp. 288–294.——"Rice Cultivation in Low-lying Land in Burma," Hosain, in Agric. Journ. India, iv. July 1909, pp. 279–281.——"Rice, *Oryza sativa*," in Third Annual Report on Agriculture, N. Nigeria Gazette, July 31st, 1909, p. 156.——Rice Culture, Knapp, U.S. Dept. Agric. Bull. No. 417, 1910, pp. 1–30.——Literature of the Races of Rice in India (compiled in the office of the Reporter on Econ. Products, India), Agric. Ledger, No. 1, 1910, pp. 1–594.——"Country Grown Rice," in A Transformed Colony, Sierra Leone: Its Progress, etc. Alldridge pp. 342–348 (Seeley & Co. Ltd. London, 1910).——"Rice Growing in the Philippines," Apostol, in Philippine Agric. Review, iii. 1910, pp. 625–638.——Der Reisbau in Siam, Hosseus, in Der Tropenflanzer, xv. 1911, No. 6 (reprint) pp. 1–16.——La Culture du Riz à la Station Agricole de Kitobola, L.P. in Bull. Agric. Congo Belge, ii. 1911, pp. 455–464.——A Preliminary Report on Rice Growing in the Sacramento Valley, Chambliss, U.S. Dept. Agric. Bureau of Pl. Industry, Circ. No. 97, 1912, pp. 1–10.——"Oryzanin, A Constituent of Rice Husks and Its Importance in Food," in Bull. Bureau Agric. Inst. Rome, iii. Oct. 1912, p. 2208.——On the Classification of Cultivated Rice, Kikkawa, in Journ. Coll. Agric. Imperial University of Tokyo, iii. No. 2, Sept. 1912, pp. 11–108, pls. v.–viii.——"The Rice Industry of Burma," Warth, in the Agric. Journ. India, vii. 1912, p. 160–166.——"La Culture du Riz au Kasai-Method Indigene, Mestdagh, in Bull. Agric. Congo Belge, iii. Sept. 1912, pp. 533–537.——"Rice Culture in the Philippines," Conner & Mackie, Bureau of Agric. Manila, Philippine Islands, Bull. No. 22, 1912, pp. 1–40, illustrated.——Der Reis, Backmann, in Der Tropenpflanzer, Beihefte, xiii. No. 4, Aug. 1912, pp. 212–386.——"Effect of Drainage on Rice Soils," Hutchinson, in Agric. Journ. India, viii. 1913, pp. 35–40; pls. v.–ix.——Notes on the Pollination and Cross Fertilisation in the Common Rice Plant, Hector, in Memoir (Bot. Series) Dept. Agric. India, vi. June 1913, pp. 1–10.——"The Cultivation of Rice with the help of Machines" ("La Culture mécanique du Riz en Indochine"),

Main, in Journn. d'Agric. Tropicale, xiii. 1913, pp. 129–133.——" Preliminary Note on the Classification of Rice in the Central Provinces," Graham, in Memoir, Dept. Agric. India, vi. Dec. 1913, pp. 209–230; pls. i.–iv.——" The Cultivation and Preparation of Rice," Bull. Imp. Inst. xi. 1913, pp. 634–655; xii. 1914, pp. 85–106.——" The Cultivation of Rice in Spain," and " the Recent International Rice Congress at Valencia," Butler, in Agric. Journ. India, ix. 1914, pp. 326–348; pl. xxix.——" Some Observations on Upper Burma Paddy " (grown under irrigation), Thompstone, l.c. x. 1915, pp. 26–53.——The Culture of Rice in California, Chambliss, U.S. Dept. Agric. Farmers' Bull. No. 188, 1915, pp. 1–20.——Irrigation Practice in Rice Growing, Haskell, U.S. Dept. Agric. Farmers' Bull. No. 673, 1915 pp. 1–12.——" Rizieres," in Bull. Agric. Congo Belge, vi. Mars–Juin 1915, pp. 8–15.——The Milling of Rice and Its Mechanical Effect upon the Grain, Wise & Broomwell, U.S. Dept. Agric. Bull. No. 330, 1916, pp. 1–29.——" History of Rice," in Agric. Journ. India, xii. July 1917, pp. 471–472.——" Production and Uses of Rice," Bull. Imp. Inst. xv. 1917, pp. 198–267.——" The Cultivation of Rice," Tropical Life, March 1918, pp. 36–39.——" Utilisation of Rice and Its By-Products," Bull. Imp. Inst. xvi. 1918, pp. 16–24.——Probable Material for the Study of the Experimental Evolution of *Oryza sativa*, var. *plena*, Prain, Bhide, in Agric. Journ. India, xiv. 1919, pp. 494–499.——Rice Cultivation, Leaflet issued by the Agricultural Dept. S. Provinces Nigeria, 1919.——Prairie Rice Culture in the United States, Chambliss, U.S. Dept. Agric. Farmers' Bull. No. 1092, 1920, pp. 1–26, illustrated.——" Some Aspects of the Salt Requirements of Young Rice Plants," Espino, in Philippine Journ. Science, xvi. May 1920, pp. 455–525.——" The Growth of Rice as Related to Proportions of Fertilizer Salts added to Soil Culture," Trelease, in Philippine Journ. Science, xvi. June 1920, pp. 603–627.——" Notes on Harvesting Padi and Its Conversion into Rice," Jack, in Agric. Bull. Fed. Malay States, viii. 1920, pp. 1–5.

Leersia, Sw.

Leersia hexandra, *Sw.*; Fl. Trop. Afr. ined.

Ill.—Kunth, Rév. Gram. i. t. 1 (*L. mexicana*); Symonds, Indian Grasses, t. 55; Wood, Natal Pl. v. t. 445; Agric. Gaz. N.S. Wales, 1906, p. 1040.

Vernac. names.—Akeko (Lagos, *MacGregor*); Layu Sing (India, *Duthie*); Layu (India *Watt*); Bareet Grass (Philippines, *Piper*).

Lagos, Nupe, Abinsi, etc. in Nigeria, in Belgian Congo, S. Africa and widely spread in tropical and sub-tropical regions.

Horses and cattle are fond of this grass in India, said to be one of the most esteemed of the aquatic grasses for fodder in Eastern Australia and regularly cultivated for fodder in the

Philippines (Watt. Dict. Econ. Prod. India; Piper, Forage Pl. p. 44).

A perennial, 4 ft. high, found in swamps, Nupe (Barter, Herb. Kew), 1–2 ft. high in rice fields, Abinsi (Dalziel, Herb. Kew); cultivated in the same way as rice, Philippines (Watt, l.c.); rhizomes creeping and stoloniferous (Fl. Cap. vii. p. 659); usually 5–8 ft. with graceful floating immersed culms, upper portion 1–1½ ft. immersed and flowering; in very deep ponds or in marshy wooded places, Golungo Alto and Pungo Andongo Angola (Hiern, Cat. Welw. Afr. Pl. ii. p. 231—*Homalocenchrus hexandrus,* O.K.); extensively cultivated about the towns in the Philippines as a soiling crop—cut green, tied into bundles and marketed fresh each day—for horses (Piper, l.c.—*Homalocenchrus hexandrus*).

TRITICUM, Linn.

Triticum vulgare, *Vill.* Hist. Pl. Dauph. ii. (1787) p. 153; **T. durum,** *Desf.* Fl. Atlant. i. (1798) p. 114.

Vernac. names.—Alkama (Hausa, *Dalziel, Dudgeon, Foster*); Burr (Hadramant, *Lunt*).—Wheat.

N. Nigeria (Foster, No. 21, 1915, Herb. Kew), Katsina, Sokoto (Rae, 1921, Herb. Kew); Kano, Zaria (specimens in Herb. and Museum, Kew, 1914; plants grown at Kew from seed obtained at the Tropical Products Exhibition in London 1914); Bammako, Soudan (Chevalier, No. 217, 1899, Herb. Kew); in the neighbourhood of Lake Chad—all of the above specimens are bearded and they appear to be the same form of "common wheat" [*vulgare*] and probably the same race occurs over a wide area, extending northwards to the Sahara. Chevalier is of opinion that it originated in Asia Minor and states that it is cultivated in the northern parts of Tropical Africa (Bull. Soc. Nat. Accl. France, 1912, p. 386—*T. durum* var. *leucurum*). A beardless variety of *T. vulgare* has also recently been received (Rae, July 1921, Herb. Kew) from Katsina. The separation of the varieties and races appears to become increasingly difficult in proportion to the extent of the distribution—the grain of the common wheat [*vulgare*] is stated (Percival, *seq.*) to become more flinty [*durum*] in hot dry countries than in cool countries, soil and manures also influencing this feature and similarly climate and cultural conditions may change the colour—white, yellow or red—of the grain.

Until such time as a wider range of specimens of the wheats grown in Nigeria can be obtained, the indigenous or naturalized types must be accepted as botanically mixed—when except from a historical point of view the determination may be of little importance—they are it is reported, being rapidly replaced by Indian selected wheats from the Agricultural Research Institute, Pusa, introduced in 1919. The Indian wheats come chiefly under *sativum* (*vulgare*) (Howard, Mem. Dept. Agric. India, May 1909,

seq.). Wheat in many varieties is cultivated in the United States, Canada, British India, Argentine, Australia, Russia, Chile, New Zealand, Roumania, Persia, Netherlands, Belgium and more or less all over the Northern Temperate zone, the countries specified being the chief sources of the commercial supplies.

As a food-grain it is so well-known as to need no description. As a food-crop in Nigeria it is said to be scarcely within the reach of the poor class; but it is appreciated by the wealthy for making a brown flour; also used by the white residents for making bread with or without the admixture of imported white flour (Dudgeon, N. Nig. Gaz. July 31st, 1909, p. 156. Samples of wheat from Kano and Zaria analysed at the Imperial Institute were found to contain, Gluten 11·3 and 10·7 per cent., Gliadin 5·9 and 6·3 per cent. respectively as compared with 9·9 per cent. of Gluten and 5 per cent. of Gliadin in a sample of North Western Spring Wheat from U.S. America; Grain Merchants in London valued (Oct. 1909) the Kano sample at about 36*s.* 6*d.* and that from Zaria about 37*s.* 6*d.* per 480 lb. c.i.f. and as the result of milling and baking experiments it was reported that the grain from Kano would find a ready sale in the United Kingdom and that for quality it was not far behind "Gluyas," a wheat stated to be particularly suitable for cultivation in British East Africa (N. Nig. Gaz. April 30th, 1910, p. 93; Bull. Imp. Inst. 1910, p. 118; Col. Rep. Ann. No. 656, 1910, p. 33; No. 687, 1911, p. 33) introduced from the Agricultural College, Roseworthy, South Australia (Circ. No. 24, Dept. Agric. Nairobi). The greater part of the wheat sown in Kano is reported to be obtained from the town of Begwai and neighbourhood in the sub-district of Madowaikin of the Province. The wheat farms are divided up into Komai in the same way as the onion farms and watered by the same method of irrigation. The produce of one Komi is worth about 1*d.*, it is sold by the mudu (a smaller weight) at 2*d.* a mudu at harvest time, the price rising to 3*d.* or more by the end of the season—one mudu should contain the produce of two Komai, and a wheat farm of 600 Komai would therefore give a gross profit of about £2 10*s.* 0 or say, a net profit of about £2 (Gepp, Report on the sub-district of Dan Isa: N. Nig. Gaz. April 29th, 1911, p. 95, Suppl. p. viii). It is here (Kano) recommended that the seed be sown in November or December so that harvesting—five months or so later—may be done before the rains begin (l.c.); but it is also reported that in Kano wheat is grown as a rainy season crop, being sown in May (Dudgeon, N. Nig. Gaz. July 31st, 1909, p. 156). Cultivated chiefly in the north on riverbanks with irrigation (Dalziel, Hausa Bot. Voc. p. 8). In Zaria wheat is frequently sown in October and occupies land in the dry season which may have been under rice during the previous rainy season; goat manure is applied to the field and it is irrigated from an adjoining river, or from wells, calabashes, or "shadufs" being employed to raise the water to the channels (Dudgeon, l.c.).

In general wheat requires a comparatively dry climate or a moderate rainfall, and rich well drained soil. At home it usually follows clover or other leguminous crops. Seed may be sown at the rate of 2–3 bushels (average about 62 lb. per bush.) per acre —broadcast or drilled, or under "dry farming" conditions 30–45 lb. of seed per acre drilled in is said to give larger returns than when sown more thickly (MacDonald, *seq.*); and the crop comes to maturity in about 5 months more or less according to the climate or season in which it may be sown. What is claimed to be a record in modern Agriculture, so far as rainfall is concerned, is that under the "Dry Farming System," in the dry lands of Lichtenburg in the Western Transvaal, the *durum* wheat "Apulia"—so called as being introduced from the Italian Province of that name—has been grown without a drop of rain from seed -time until harvest (MacDonald, The Conquest of the Desert, p. 102). The *durum* wheats are also known as "Flint," "Hard" and "Macaroni," commonly grown in S. Russia, the Mediterranean region and N. Africa—"Bieloturka," "Kubanka" and "Arnautka, "grown in Russia have been recommended for dry hot regions.

It would seem advisable for the best chances of success to get similar strains or those wheats that have been grown in climates approximating to that of Northern Nigeria as in India and the drier regions mentioned above. Wheat seed from England grown in B.C. Africa (Nyasaland) proved a failure—though at the same time it may be mentioned, barley (*Hordeum vulgare*) and Oats (*Avena sativa*) from English seed did well—the wheat germinated well but grew in tufts like grass and failed to throw up grain stalks. Acclimatised seed, however, from Tanganyika —originally imported many years before by the Arabs—succeeded better and yielded at the rate of 9 bushels per acre without manure; seed was being distributed (1895) from the stock thus raised, to European planters and Native Chiefs and it was hoped to grow at least enough for local use, the Missionaries on Tanganyika were at the time growing sufficient for their own needs (Kew Bull. 1895, p. 187). Wheats from England, including "White Stand Up," "Red Stand up," "Little Joss," "Carters White Fife" and "Dreadnought" were all reported as failures at the Experimental farm, Kabete, Nairobi—1912, sown in November. An acre each of "Early Rieti," "Thew" and "Bobs" planted May 11th and harvested towards the end of September 1912 had the yield spoiled in all cases by myriads of birds; the highest yield was 446 lb. per acre from "Thew" which was said to be also practically undamaged by "rust"—which had been the cause of serious damage in different varieties grown in 1911 at the same station (Ann. Rep. Dept. Agric. B.E. Africa 1912–1913, Nairobi Exp. Farm, Kabete, p. 115). The South Australian wheat "Glugas" or "Gluyas" above referred to was said to be rust-resisting; but although not entirely immune at Nairobi it was not seriously damaged. An

acre dressed with 15 cartloads of farm-yard manure was sown with 75 lb. (85 lb. recommended later) of seed 17th November 1906, germination good 22nd November; in full ear 24th Jan. 1907; commenced to ripen 14th February and reaped 6th March, yielding 21 bushels (64 lb. per bushel) of clean dry grain. The rainfall during the period-seed time to harvest — was 12·45 in., rain fell on 37 days, the greater falls occurring on 27th January —2·12 in. and 25th February—2·25 in.; the season being considered a very favourable one (Circ. No. 24, Dept. Agric. Nairobi). About a ton of seed of this variety was distributed in Toro, Uganda in 1909 and a small threshing and winnowing machine has been fixed up at Fort Portal for the use of the growers (Col. Rep. Misc. No. 64 1909, p. 9).

Ref.—Les Meilleurs Blés, Vilmorin-Andrieux, pp. 1–175, with numerous coloured plates (Vilmorin-Andrieux & Co. Paris, 1880).——"*Triticum sativum*," in Dict. Econ. Prod. India, Watt, vi. part 4, 1893, pp. 89–202.——Note on the Races of Wheat Cultivated in Bengal, Prain, Agric. Series No. 2, Dept. of Land Records and Agric. Bengal, Bull. No. 3, 1896, pp. 1–19 2 pls. and a map.——Macaroni Wheats, Carleton, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 3, 1901, pp. 1–62.——*Triticum vulgare* (Wheat): Australian Methods of Testing and Improving Wheat; Their Applicability to India with special reference to the prevention of "rust," Moreland, Agric. Ledger, No. 2, 1901, pp. 11–31, illustr.——Emmer: A Grain for the Semi-Arid Regions, Carleton, U.S. Dept. Agric. Farmers' Bull. No. 139, 1901, pp. 1–15.——The Algerian Durum Wheats; A Classified List with descriptions, Scofield, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 7, 1902, pp. 1–48, pls. i.–xviii.——The Chief Species, Races and Varieties of European Cereals, Percival, including Cultivated Wheats, pp. 2–6 (Headley Brothers, London, 1902).——Manufacture of Semolina and Macaroni, Skinner, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 20, 1902, pp. 1–31, pls. i.–v.——The Description of Wheat Varieties, Scofield, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 47, 1903, pp. 1–19, pls. i.–vii.——"Saragolla Wheat," Fairchild, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 25, 1903, pp. 9–12.——Emmer and Spelt, Saunders, Dept. Agric. Ottawa, Canada, Bull. No. 45, 1904, pp. 1–16, ff. 1–6.——The Commercial Status of Durum Wheat, Carleton & Chamberlain, U.S. Dept. Agric Bur. Pl. Industry, Bull. No. 70, 1904, pp. 1–70, pls. i.–v.——Improving the Quality of Wheat, Lyon, U.S. Dept. Agric. Bur. Pl. Industry, Bull. No. 78, 1905, pp. 1–120.——The Variability of Wheat Varieties in Resistance to Toxic Salts, Harter, l.c. Bull. No. 79, 1905, pp. 1–47.——Cultivation of Wheat in Permanent Alfalfa Fields, Fairchild, l.c., Bull. No. 75, 1905, pp. 5–7.——"Wheat, *Triticum sativum*," Elliott & Lyon, in Cycl. Amer. Agric. Bailey, ii. pp. 660–670 (Macmillan & Co. London, 1907).——"The Wheat Plant (*Triticum vulgare*)" in The Commercial Products of India, Watt, pp. 1082–1105 (John Murray,

London, 1908).——"Wheat growing in the Western Transvaal," Burtt-Davy, in Transvaal Agric. Journ. vi. Jan. 1908, pp. 250–259.——Les Blés Cultivés, Denaiffe & Sirodot, pp. 1–91, ff. 1–175 (J. B. Baillière & Fils, Paris, 1909).——The Varietal Characters of Indian Wheats, Howard & Howard, Dept. of Agric. India, Memoir, Bot. Series, ii. May 1909, pp. 1–65.——"The Durum Wheats," MacDonald, in Transvaal Agric. Journ. viii. Jan. 1910, pp. 290–292.——"Wheats from African Colonies and India," Bull. Imp. Inst. viii. 1910, pp. 115–121—including East Africa Protectorate, Uganda, N. Nigeria and Sind.——Handling of Wheat from Field to Mill, Fitz. U.S. Dept. Agric. Bureau Pl. Ind. Circ. No. 68, 1910, pp. 1–12.——Memorandum on Indian Wheat for the British Market, Wilson, Agric. Research Institute, Pusa, Bull, No. 20, 1910, pp. 1–40.——"The Wheat Problems" (Union Dry Farming Congress Pretoria 1911), MacDonald, in Agric. Journ. Union S. Africa, ii. Nov. 1911, pp. 655–660.——On the Inheritance of some characters in Wheat, Howard & Howard, Dept. Agric. India, Memoirs, v. No. 1, Sept. 1912, pp. 1–47; vii. Oct. 1915, pp. 273–285, pls. i.–viii.——"Wheat from the East African Protectorate," Bull. Imp. Inst. x. 1912, pp. 561–562.——"Report on Wheat Breeding," Evans, Dept. Agric. B.E. Africa, Ann. Rep. 1912–1913, pp. 144–148.——Experiments in Wheat Breeding, Montgomery, U.S. Dept. Agric. Bur. Pl. Ind. Bull. No. 269, 1913, pp. 1–61, illustr.——"The Improvement of Indian Wheat," Howard & Howard, in Agric. Journ. India, viii. 1913, pp. 27–34.——Wild Wheat in Palestine, Cook, U.S. Dept. Agric., Bur. Pl. Ind., Bull. No. 274, 1913, pp. 1–56; pls. i.–xv.——"A Rainless Wheat" ("Apulia") in The Conquest of the Desert, MacDonald, pp. 83–119 (T. Werner Laurie Ltd., London, 1913).——The Influence of the Environment on the Milling and Baking Qualities of Wheat in India, Howard, Leake & Howard, Dept. Agric. India, Memoirs, v. No. 2, Jan. 1913, pp. 49–102 and vi. No. 8, Dec. 1914, pp. 233–266.——Thirteen Years of Wheat Selection, Hutcheson, in The American Naturalist, xlviii. August 1914, pp. 459–466—"polonicum," "spelta," "turgidum," "durum" and "vulgare" types.—"Wheat from the Sudan," Bull. Imp. Inst. xii. 1914, pp. 352–354.——"Seed Supply of the New Pusa Wheats," Howard & Howard, in Agric. Journ. India, ix. 1914, pp. 247–253, pl. xx (ears of wheat, Nos. 4, 6, 7, 8, 12, 101, 106, 110).——"Wheat from Egypt," Bull. Imp. Inst. xiii. 1915, pp. 13–15.——"Qualities desired in Wheat for British Markets and how to ascertain them, Buck, in Bull. Bur. Agric. Intelligence, Rome, vi. No. 6, June 1915, pp. 773–779.——The Wheats of Baluchistan, Khorasan and the Kurram Valley, Howard, Dept. Agric. India, Memoir viii. Aug. 1916, pp. 1–88, pl. i. and Map.——The Drying for Milling Purposes of Damp and Garlicky Wheat, Cox, U.S. Dept. Agric. Bull. No. 455, 1916, pp. 1–10.——"Alaska" and "Stoner" or "Miracle" Wheats: Two Varieties much misrepresented, Ball,

U.S. Dept. Agric. Bull. No. 357, 1916, pp. 1–28, illustr.——"The Production of Wheat in Egypt," Bull. Imp. Inst. xv. 1917, pp. 78–82.——Experiments with Durum Wheat, Ball & Clark, U.S. Dept. Agric. Bull. No. 618, 1918, pp. 1–64, illustr.——"The Future of Wheat Production with special reference to the Empire," Bull. Imp. Inst. xvii. 1919, pp. 205–235.——Wheat, Dowson, Dept. of Agric. Nairobi, B.E. Africa, Bull. No. 4, 1919, pp. 1–16; "Wheat in East Africa," Kew Bull. 1920, pp. 78–79.——The Wheat Plant, Percival, pp. 1–463, illustr. (Duckworth & Co., London, 1921).——Journal of the Ministry of Agriculture, United Kingdom—numerous notes and papers, including Suppl. No. 4, 1910—"History," Stapf; "Breeding," Biffen; "Factors Determining Yield," Hall and Russell, &c., pp. 1–84.

OXYTENANTHERA, Munro.

Oxytenanthera abyssinica, *Munro*; Fl. Trop. Afr. ined.

Ill.—Camus, Bambusées, t. 90.

Vernac. names.—Gora (Sokoto, Hausa, *Dalziel*); Ganna (Arabic, *Muriel*); Medera (Hameg, *Muriel*).

Nupe, Sokoto, Cross River Region, Old Calabar, etc. in Nigeria, also known from Gold Coast; Gambia, Sierra Leone, Togoland, Cameroons etc. and widely distributed in Tropical Africa.

Larger stems used to pole canoes, smaller ones as shafts for spears, Nupe (Barter, Herb. Kew); stems cut into strips and interwoven to form fences of the squares and villages, entire they are made into handles for many instruments and also serve for the framework of the roofs of the huts, Gambia (Kew Bull. 1892, p. 45); used for canoes and shafts for arrows (Camus, l.c. p. 144); large-sized stems cut so as to include a node for the base, used as "pots" for propagating plants, Old Calabar.

Stems 25–50 ft. high, $1\frac{1}{2}$–3 in. [or more] in diam. at the base, (Kew Bull. l.c.), 20 ft. high, much branched and spreading, "the only arboreal grass seen hitherto," banks of a rivulet, N. Nupe (Barter, Herb. Kew), 60–70 ft. high Mozambique (Johnson, Herb. Kew); 20–30 ft. found in ravines in the bush, Sokoto (Dalziel, Herb. Kew; Hausa Bot. Voc. p. 40); "a particularly fine bamboo resembling *Dendrocalamus Hamiltonii* of Burma, but does not attain quite such large dimensions, that forms extensive clumps, common about the Sibiri Stream, Gold Coast, never found far from existing villages or old abandoned sites; the ground under the clumps affords excellent camping sites (Thompson, Col. Rep. Misc. No. 66, 1910, p. 40—*Dendrocalamus sp.*?).

The senior Conservator of Forests of Northern Nigeria reports that Bamboos (*Oxytenanthera abyssinica*) flowered profusely (1919) on the Naraguta Hills and seed was collected to sow broadcast on the more barren slopes (Thompson, Rep. Forest Adm. Nigeria for 1919, p. 7).

Dendrocalamus, Nees.

Dendrocalamus strictus, *Nees* in Linnaea, IX (1834) p. 476.

Culms 20-50 ft. high by 1–3 in. diam., hollow in moist climates, solid in dry, young glaucous green, old yellowish, nodes swollen, lower often rooting, internodes 12–18 in. (Fl. Br. India, vii. p. 404); greyish-green, often blotched, closely packed in dense clumps; internodes 10-15 in. long, 2–3 in. diam., in dry districts almost solid, in a moist climate hollow with thick walls (Brandis, Indian Trees, p. 675).

Ill.—Beddome, Fl. Sylv. t. 325; Brandis, For. Fl. t. 70; Gamble, Bambuseae of Br. India (Annals Roy. Bot. Gdn. Calcutta, vii. 1896), tt. 68, 69; Camus, Bambusées, t. 35, f. C; t. 87, f. B.

Solid or Male Bamboo.

India, Burma. Cultivated in Nigeria, West Indies—Dominica, etc.

Grain used for food in times of famine and the young and tender shoots are largely eaten as a vegetable; the leaves are much sought after as food for buffaloes and horses and the stems are used for various purposes—rafters battens, spear and lance shafts—for this purpose the canes with no central cavity are sought for (Gamble, Memo. to Director, Kew, Jan. 21st, 1918)—walking-sticks, whip-handles, the manufacture of mats, roofing, etc. in India, where it is stated to be the most universally used of all the Bamboos (Watt, Comm. Prod. India, p. 102). One of the chief European uses for this bamboo is the manufacture of lance shafts (l.c.) and it has been suggested for use in aeroplane construction.

Half a pound of seed, purchased at the Royal Botanic Gardens, Calcutta, was obtained for the Western Province Botanic Garden Oloke-Meji in 1906 (Col. Rep. Misc. No. 51, 1908 (for 1906), p. 90) and in 1907 it was reported that plants had been put out in the gardens at the Governor's Rest House, Ibadan, and a plantation made (S. Nig. Govt. Gaz. Suppl. 30th Oct. 1907—Report on Forests & Agric. W. Prov. for June Quarter 1907: *Ibid.* Suppl. 15th April 1908, for Sept. Quarter 1907). This bamboo is said to be suited to dry places and to succeed well in the West Indies (Agric. News, Barbados, March 23rd, 1907, p. 92). In the Western half of the dangs of Surat it is estimated that there are 35 million culms of this bamboo which on a five year cutting rotation—of the half of each clump would give 14,000 tons of dry material or 5600 tons of pulp for paper making per annum (Pearson, Indian Forester, xlvi. 1920, p. 603: Bull. Imp. Inst. 1920, p. 539). There is a large and growing local demand for Bamboo to be met here and throughout India.

This species is the commonest, strongest and best all round of the Indian Bamboos, deciduous, found in all the dry forests of Central India, the Deccan, Burma and perhaps most of all

along the foot of the Himalaya, and the supply from Government Forests is almost unlimited and the outturn from one Forest Division only, averages about 10,000,000 canes yearly (Gamble, Memo. to Director, Kew, Jan. 21st, 1918).

Ref.—" Food Grains of India—*Dendrocalamus strictus,*" in Kew Bull. 1889, pp. 283–284.——*Dendrocalamus strictus* (Male Bamboo), Bamboo Manna : Its occurrence in the Central Provinces, India, Hooper, in The Agric. Ledger No. 17, 1900, pp. 185–189.——" The Male Bamboo," in The Agric. News, Barbados, xi. Sept. 28th, 1912, p. 311.

The Bamboos generally are useful in many ways; as fodder or food, the young shoots of probably all are eaten more or less for food in India (Watt) and China (Hosie, Rep. Ssuchuan, W. China, No. 5, 1904, p. 16), and on the rare occasions when the plants flower or fruit, the grain of many species appears to be of value. The culms of the large kinds may be cut up to serve for flower pots, split Bamboo, twisted or plaited, is used for making ropes in China, an important centre where the plants are cultivated for the purpose being the lower Yuen Fu River (Kew Bull. 1909, p. 316), and they may be used for various constructional works; the smaller kinds are used for making furniture, and in the hollow stems of some species, *Bambusa arundinacea*, etc. a deposit occurs called " Tabashir " or " Bamboo Manna," used for medicinal purposes in India (Watt, Dict. Econ. Prod. India).

The stems of Bamboo have for many years been recommended as a source of material for paper-making; there are samples of crushed Bamboo (1874) and (1879) paper in the Museum at Kew (1883) made by Mr. Routledge, who published in 1875 a pamphlet on " Bamboo as a Paper-making Material," where it is stated—" of all the fibre-yielding plants known to botanical science there is not one so well calculated to meet the pressing requirements of the Paper-trade as " Bamboo " both as regards facility of economy and production as well as the quality of the paper-stock which can be manufactured therefrom." This opinion would seem to have held good up to the present time as in all the experiments since undertaken it has been generally conceded that a first-class paper can be produced from Bamboo pulp. A sample of Bamboo Paper Pulp made by the Société des Pulpes et Paperteries du Tonkin presented to the Museum by Messrs. Ide and Christie in 1913, formed part of the first supplies, in quantity, that had come so it was believed from the East to England. Considerable research work has recently been carried on in India and amongst recent publications on this subject may be mentioned—" Paper Making Fibre from the Bamboo of British Burma," Routledge, in discussion on Paper by Sir Arthur Fayre—Soc. of Arts, May 13th, 1881—in " The Paper Makers' Monthly Journal, June, 15th 1881, pp. 186–188." Bamboo Fibre as a Paper Material," in The Commercial

Products of India, by Sir G. Watt (1908), pp. 108–110. Bamboo for Paper-Making, by W. R. Sindall, pp. 1–59 (Marchant Singer & Co. London, 1909). "Megass and Bamboo Paper in Trinidad," Journ. Roy. Soc. Arts, Sept. 1st, 1911, p. 974. "Report on the Investigation of Bamboo as a material for Production of Paper-Pulp," by W. Raitt, in The Indian Forest Records, iii. part 3, 1912, pp. 1–37, and "Note on the Utilisation of Bamboo for the Manufacture of Paper-Pulp," by R. S. Pearson, l.c. iv. part 5, 1913, pp. 1–121—Kew Bull. 1913, pp. 128–129; "Bamboo" in "New Sources of Supply for the Manufacture of Paper," by Clayton Beadle and H. P. Stevens, in Journal of the Royal Society of Arts, Feb. 14th, 1913, pp. 349–351; "Manufacture of Paper-Pulp for Export," Bull. Imp. Inst. xi. 1913, pp. 136–141—including Bamboo; "The Utilisation of Bamboo for Paper-making," l.c. xviii. 1920, pp. 403–427.

The principal species recommended are *Bambusa polymorpha, Munro*, 60–80 ft. high, *B. arundinacea*, Willd., the "Spiny Bamboo," 80–100 ft. high; *B. Tulda*, Roxb., 20–70 ft. high, India & Burma; *Cephalostachyum pergracile*, Munro, 30–40 ft. high, of Burma, and *Melocanna bambusoides*, Trin., the "Terai" or "Berry-bearing" Bamboo; 50–70 ft. high of Eastern Bengal and Burma. The most useful species is probably *Bambusa polymorpha*—the report by Raitt (l.c) is printed on paper made from it and so also the work by Sindall, above mentioned. The production of pulp appears to be still more or less in the experimental stage and when the difficulties of treatment have all been overcome, the available sources—almost unlimited in the British Empire—should make this industry capable of the highest development under the care of the Forestry Departments of our Tropical Colonies. The economical treatment of Bamboo is said to be largely dependent upon its treatment preparatory to the boiling and the main object is to produce a clean pulp to sell at the best possible price. In a mill recently (about 1913) equipped by Messrs. James Bertram & Son, Ltd. in China, the method is to first remove all knots; the internodes are then cut into pieces 1 in. long to allow of economical boiling with the minimum of soda. This mill is capable of producing 18–20 tons of dry bamboo-pulp per twenty-four hours. Attempts are being made to provide a simple and efficient machine to treat the stems without removing the knots. Raitt recommends as the proper mode of treatment—crushing, then treating for extraction of starchy matter prior to digestion by the "sulphate process" (Beadle & Stevens, Journ. Roy. Soc. Arts, l.c.). He estimates (Indian Forest Records, iii. 1912) the cost of treatment for the production of unbleached bamboo-pulp at "92 rupees 8 annas or say £6–3*s*. 4*d*. per ton of 2240 lb. and for bleached pulp 125 rupees per ton."—which "brings the cost of bleached bamboo-pulp up to £9 per ton; this would, if shipped to this country, apparently yield no margin of profit in competition with bleach-wood-pulp" (Beadle & Stevens, l.c. p. 350).

The cultivation is comparatively easy, by seeds or division of the root stocks—this perhaps being the more common, owing to the rarity in some species of seed production. The growth at times is remarkable—*Bambusa vulgaris* in the Palm House at Kew," grew at the rate of 3 ft. in a single week (Routledge (1875) l.c.). In Ceylon it has been found that "growth is always more rapid by night than by day, the average hourly growth between 7 a.m. and 5 p.m. (day) was 6 mm., between 5 p.m. and 7 a.m. (night) 16 mm. at heights of 3–12 metres, the most rapid growth recorded at night was 23 mm. per hour (Lock, *seq.* p. 265), and in Trinidad the giant bamboo has been observed to make a growth of 12 in. in 24 hours or ½ in. per hour at the early period of the season of growth; but this rapidity gradually lessens as the stem reaches its normal height, 60–80 ft. (Bull. Roy. Bot. Gdns. Trinidad, Jan. 1907, p. 179). Some big figures have been given accordingly, purporting to show the possible production of pulp-material over a certain area in a given time; but whilst admitting without doubt the rapidity of growth in well-established clumps, the calculations for large areas are liable to some uncertainty in maintaining a steady supply under cultivation. The suitability of the culms for working and the period of rotation for cutting are important factors. *Bambusa polymorpha*—the most useful is smaller than *B. arundinacea*, which is difficult to work with owing to the weight of the culms and the hardness of the nodes; but *Cephalostachyum pergracile*, though smaller than *B. polymorpha*, is considered quite as suitable for paper pulp. These three species require a 5 years' rotation for cutting and for *Melocanna bambusoides*, 7 years has to be allowed (Kew Bull. 1913, p. 129). In Trinidad (l.c.) it has been found that it takes 10 years at least to produce a fair-sized clump of Bamboo to stand regular cutting once in 2 years, and that reaping experiments show that frequent cutting results in the death of the stools. Paper, however, has been successfully made from Bamboo pulp in Trinidad, and it is reported that a firm in Edinburgh have a concession for cutting bamboo in the Government forests and have planted 1000 acres near St. Joseph, 7 miles from Port of Spain (Bull. Imp. Inst. 1920, p. 416). There are many thousands of acres of Bamboo forest on the slopes of Kenya in East Africa where *Arundinaria alpina* is said to be common, the culms attaining a height of 60 ft. with a diameter at the base of 5 in. (l.c. pp. 406, 417). There is no doubt that the climate of Nigeria is suitable for Bamboos and the cultivation might be largely extended by the introduction of species other than the *Oxytenanthera* and *Dendrocalamus*, already well established there and may with advantage include those above mentioned that are recommended for the production of paper-pulp.

Ref.—Les Bambous, Végétation, Culture, Multiplication, en Europe, en Algérie, Riviére & Riviere, pp. 1–364, illustr. (Paris, 1878).——"Bamboo" in Dict. Econ. Prod. India, Watt, i. 1889, pp. 370–394.——"Bamboo," Hubbard, U.S. Dept. Agric.

Div. Forestry, Bull. No. 11, 1895, pp. 29–32.——The Bambuseae of British India, Gamble, in Annals Roy. Bot. Gdn. Calcutta, vii. pp. 1–133; pls. 1–119 (Printed at the Bengal Secretariat Press, Calcutta, 1896: Bernard Quaritch, A. Constable & Co., E. A. Arnold & Co. &c. London).——"Bamboo Manna," Hooper, in Pharm. Journ. x. 1900, p. 640.——"On the Growth of Giant Bamboos," Lock, in Annals, Roy. Bot. Gdns. Peradeniya, ii. part 2, August 1904, pp. 211–266; pls. xxi.–xxiii.——"The Flowering of Cultivated Bamboos," Bean, in Kew Bull. 1907, pp. 228–233.——"Chinese Bamboo Ropes," Kew Bull. 1909, pp. 316–317.——"The Bamboo Wattle Silo," Coventry, in Agric. Journ. India, vi. 1911, pp. 20–26, illustr.——"Bamboo Leaves as Fodder & Litter," Agric. News, Barbados, xi. March 30th, 1912, p. 103.——"The Bamboo Forests of the Pegu Forest Division and the Method of Extraction," Butterwick, in Indian Forester, xxxix. April 1913, pp. 176–183.——Les Bambusées: Monogr. Biol. Cult. Principaux Usages, Camus, pp. 1–215 (Paris, 1913).——"Bamboos in Burma," Bull. Imp. Inst. xi. 1913, pp. 534–536.——Philippine Bamboos, Brown & Fischer, Bureau of Forestry, Manila, Bull. No. 15, 1918, pp. 1–32; pls. i.–xxxiii.——"Bamboos and Boring Beetles," Boodle & Dallimore, in Kew Bull. 1920, pp. 282–285.

FILICES.

PTERIDIUM, Gleditsch.

Pteridium aquilinum, *Kuhn*, v. Deck. Reisen, iii. 3, Bot. (1879), p. 11; Christensen, Index Filicum, ii. (1906), p. 591. [*Pteris Aquilina*, Linn. Sp. Pl. ii. (1753), p. 1073]. Caudex creeping below the surface of the soil, black, fleshy. Stipes erect, 1–6 ft., sometimes 10 ft. high. Fronds 2–3 ft. or more downy when young, bipinnate or sometimes tripinnate. Sori continuous along the incurved margins of the pinnae. In general a very variable plant.

Ill.—Hooker, Brit. Ferns, t. 38.

Bracken or Brake.

Found in many temperate or warm countries. Collected at Old Calabar and noted on Cross River Expedition (1900).

The rootstocks or rhizomes and young fronds ground into meal have been suggested for feeding pigs and poultry (Journ. Bd. Agric. March 1917, p. 1252). A farinaceous food has been obtained from the rootstocks for use as food in times of scarcity in Britain; the meal is used as food in Japan and at one time was used roasted as food by the Natives of New Zealand (Mus. Kew and Bull. 1919, p. 82); the rhizomes are dug up, dried and manufactured into a white starchy substance, which is baked into cakes for food in Ssuchuan, China, where also the young fronds are cooked as a vegetable (Hosie, Rep. Ssuchuan, W. China, No. 5, 1904, p. 13).

This fern is found in so great a variety of situations that it does not appear to be at all choice as to soil; it will grow in fairly open places and under shade, developing best, however, in those that are moist, warm and sheltered.

Ref.—"The Structure of the Leaves of the Bracken (*Pteris aquilina*) in relation to Environment," Boodle, in Journ. Linn. Soc. xxxv. 1901–04, pp. 659–669.——"On the Use of Fern-root (*Pteris aquilina*) in German Pig-feeding Experiments," Hausen & Mez, in Bull. Bur. Agric. Int. Rome, vii. May 1916, pp. 715–716.——"The Use of Bracken Roots and Fronds," in Journ. Bd. Agric. March 1917, pp. 1252–1255.——"The Composition of the Rhizomes of Bracken and Its Variations," Hendrick, Kew Bull. 1921, pp. 157–166.

Other ferns found are *Ophioglossum vulgatum*, Linn. the common "Adder's Tongue" of Europe, observed on Calabar Hill, when clearing thick bush under which it seemed to thrive. Dalziel (Hausa Bot. Voc. p. 75) gives the Hausa name as "Mashin Zomo" and *Platycerium aethiopicum.* "Elk's Horn Fern," Hausa name, "Dafaddu" (l.c.) is found on the trunks of the "Oil Palm" (*Elaeis guineensis*) and other trees—are here mentioned only because the first is one of the few rare specimens typical of home and the other is grown at Kew and possesses some decorative value. "Agugu" is the rhizome of a fern, a native drug used for tapeworm, brought chiefly from Adamawa; it is not indigenous and is said to be probably (*Nephrodium Filix-mas*, the "Male Fern" (Dalziel, l.c. p. 6).

FUNGI.

Of this extensive order there are a few that appear to be common all over the world such as *Fomes lucidus*, Fries, *Polystictus versicolor*, Fries, etc. of no economic value. *Daldinia concentrica*, Cesati, is also found in Europe, United States, Australia, Tasmania, etc., on dead trunks; used by the Natives of West Africa as a purgative medicine, being mashed up and mixed with lime-juice, the quantity of *Daldinia* for a dose forming when mashed, a small ball about half an inch through with the juice of half a lime. *Volvaria esculenta*, Massee (Kew Bull. 1908, p. 216), Old Calabar (Holland No. 24, Herb. Kew), grows abundantly on heaps of coffee pulp; has been eaten by Natives and Europeans. Determinations (by E. M. Wakefield) of Fungi, collected in Nigeria, have been published in the Bulletin, 1912, pp. 141–144 (Macfie): 1914, pp. 253–261 (Farquharson): 1917, pp. 105–111 (Farquharson), and a list (by G. Massee) of West African Fungi, including a collection from Old Calabar (Holland), was published in the Bulletin for 1901, p. 161.

APPENDIX I.

List of Books and Papers of General Interest for West Africa.

"Beschryvinghe ende historische verhael van het Gout Koninckrijck van Gunea anders de Gout-Custe de Mina genaemt, liggende in het deel van Africa. Door P. de Marees; uitgegeven door S. P. l'Honoré Naber (Werken uitgegeven door de Linschoten-Vereeniging)—A rare Dutch Account of the Gold Coast of the early 17th century, by P. de Marees; Reprint, 314 pages with facsimile map and illustrations (M. Nijhoff, The Hague, 1912).

"A New and Accurate Description of the Coast of Guinea," by William Bosman (English Translation (from the Dutch), 2nd ed. 1721).

"Nouvelle Relation de l'Afrique Occidentale," by Jean Baptiste Labat; in 5 volumes (Paris, 1728).

"Travels in the Interior Districts of Africa," 1795–97, by Mungo Park (Ed. 2, London, 1799).

"The Journal of a Mission to the Interior of Africa in 1805, by Mungo Park—with an account of the life of Mr. Park (London, 1815).

"Remarks on the Country, from Cape Palmas to the River Congo," etc., by John Adams (London, 1823).

"Narrative of Travels and Discoveries in Northern and Central Africa, 1822–24," by Major Denham, Captain Clapperton, and Dr. Oudney; Botany by Robert Brown; in 2 volumes (London, 1826).

"Records of Captain Clapperton's last Expedition to Africa," by Richard Lander; in 2 volumes (London, 1830).

"Journal of an Expedition to explore the Niger, etc.", by Richard and John Lander; in 3 volumes (London, 1832).

"Is the Quorra, which has lately been traced to its Discharge into the Sea, the same River as the Niger of the Ancients?" by W. Martin Leake in Journ. Roy. Geog. Soc., ii., 1832, pp. 1–28, with map of N. Africa.

"Narrative of an Expedition into the Interior of Africa, by the River Niger" in 1832–1834, by Macgregor Laird and R. A. K. Oldfield; in 2 volumes (London, 1837).

"A brief account of an Ascent of the Old Calabar River in 1836," by R. K. Oldfield in Journ. Roy. Geog. Soc., vii., 1837, pp. 195–198.

"Journals of the Rev. James Frederick Schon and Samuel Crowther" (who with the sanction of Her Majesty's Govt. accompanied the Expedition up the Niger in 1841, on behalf of the Church Missionary Society), 393 pages (Hatchard & Son, Piccadilly, London, 1842).

"A Private Journal kept during the Niger Expedition, 1841–1842," by William Simpson (London, 1843).

"The Lake Regions of Central Africa," by Sir R. F. Burton, in 2 volumes (London, 1843).

"Polyglotta Africana"—A Comparative Vocabulary of Words and Phrases in more than 100 distinct African Languages, by Rev. S. W. Koelle (Church Missionary Soc., London, 1845).

"On the present state and recent Progress of Ethnographical Philology," by Dr. R. G. Latham; Part 1, Africa, in British Associations Report, Oxford, 1847, pp. 154–229.

"A narrative of the Expedition sent by Her Majesty's Government to the River Niger in 1841, under the command of Capt. H. D. Trotter, R.N.", by Capt. William Allen, R.N., and T. R. H. Thomson, Surgeon, R.N., published with the sanction of the Colonial Office and the Admiralty, in 2 volumes (London, 1848).

"The Journal of an African Cruiser: Comprising Sketches of the Canaries, The Cape de Verds, Liberia, Madeira, Sierra Leone and Other Places of Interest on the West Coast of Africa," by An Officer of the U.S. Navy: edited by Nathaniel Hawthorne; 194 pages (George Clark & Son, Aberdeen; S. Richardson, London, 1848).

"Grammar of the Bornu or Kanuri Language," by Rev. S. W. Koelle (1854).

"Narrative of an Exploring Voyage up the Rivers Kwóra and Binué, commonly known as the Niger and Tsádda, in 1854: with the Languages of the Countries bordering on the Kwóra and Binué, pp. 419–445," by Dr. William Balfour Baikie; 456 pages and map (John Murray, Albemarle St., London, 1856).

"Travels and Discoveries in North and Central Africa: being a Journal of an Expedition under the auspices of H. B. M. Government, 1849–1855," by Dr. Henry Barth, in 5 volumes (Longman, Brown, Green, Longmans & Roberts, London, 1857–58), including a Voyage across the Desert to Murzuk, Asben and Sokoto, and vol. iv. deals with "The Hilly North Western Provinces of Bornu," "The Border Region between the Bornu and the Fufulde Empires," "Journey from Katsena to Sokoto," "Province of Kebbi and its River," etc.

"Impressions of Western Africa," etc., by Thomas J. Hutchinson (London, 1858).

"Medical History of the Expedition to the Niger" in 1841–1842, etc., by James Ormiston M'William (London, 1858).

"The Great Sahara: Wanderings South of the Atlas Mountains," by H. B. Tristram; 435 pages, illustrated (John Murray, London, 1860).

"Wanderings in West Africa from Liverpool to Fernando Po," by a F.R.G.S. (Sir Richard Francis Burton), in 2 volumes (London, 1863).

"Abeokuta and the Cameroons Mountains," by Sir Richard Francis Burton; in 2 volumes (Tinsley Brothers, London, 1863).

"The African Sketch Book," by Winwood Reade, in 2 volumes (London, 1873).

"The Rivers Congo and Niger, Viewed as Entrances for Commerce into Mid-Africa," by Robert Capper, Lloyd's Agent for the District, in Journ. Soc. Arts, xxiii., April 11th, 1884, pp. 500–511.

"West African Islands," by Col. A. B. Ellis (London, 1885).

"Handbook to the West African Court," Colonial and Indian Exhibition, 1886"; 37 pages; Lagos—pages 9–20 (William Clowes & Sons, Ltd., London, 1886).

"Catalogue of Exhibits, Lagos, at the Colonial and Indian Exhibition, 1886"; 16 pages. (Printed at the Lagos Times Printing Establishment.)

"Report on a Journey up the Cameroons River from Bell Town to Wuri and Budiman," with map, by H. H. Johnston (Foreign Office, London, 1886).

"Forestry of West Africa," by Sir A. Moloney, with chapter on "West African Economic Plants," by J. M. Hillier of the Royal Gardens, Kew; 533 pages (Sampson Low & Co., London, 1887).

"The Bantu Borderland in Western Africa" and "The Niger Delta," by H. H. Johnston in Proceedings, Royal Geographical Society, x. 1888, pp. 633–637, with map p. 676 and pp. 749–763, with map p. 812.

"A History of the Colonisation of Africa by Alien Races," by H. H. Johnston; 319 pages: including chapters on West Africa: 8 maps by the author and J. G. Bartholomew (Cambridge University Press, London, 1889).

"Soil and Cultivation in Yoruba Land," by Alvan Millson in Kew Bull., 1890, pp. 238–244.

"Timber of Yoruba Land," Kew Bull., 1891, pp. 41–44.

"Indigenous Plants of Yoruba Land," by Alvan Millson in Kew Bull., 1891, pp. 206–219.

"Further Reports Relative to Economic Agriculture on the Gold Coast"—in continuation of Colonial Report No. 110, Old Series—59 pages (Col. Report, Misc. Series, No. 1, 1891).

"Deutsch-Sudwest-Afrika" (1884–1887) by Dr. Hans Schinz (Zurich, 1891); 568 pages, illustrated (Oldenburg & Leipzig, 1891).

"Timbuktu: Reise Durch Marokko, Die Sahara und Den Sudan," 1879–80, by Dr. Oskar Lenz; 408 pages, with illustrations and maps (F. A. Brockhaus, Leipzig, 1892).

"The Story of Africa and Its Explorers," by Dr. Robert Brown, in 4 volumes, illustrated (Cassell & Co., London, 1892–94).

"A History of the Gold Coast" by Col. A. B. Ellis; 400 pages (Chapman & Hall, London, 1893).

"Journeys in the Benin Country, West Africa," by Capt. H. L. Gallwey in Geog. Journ., i., 1893, pp. 122–130.

"Reports on Botany and Geology": Sierra Leone, by G. F. Scott Elliot and Catherine A. Raisin; 78 pages (Col. Report, Misc. Series, No. 3, 1893).

"The Yoruba-speaking Peoples of the Slave Coast of West Africa; Their Religion, Manners, Customs, Laws, Languages, etc.", with an appendix containing a comparison of the Tshi, Ga, Ewe and Yoruba Languages, by Col. A. B. Ellis; 402 pages (Chapman & Hall, London, 1894).

"Expedition to Borgu, on the Niger," by Capt. F. D. Lugard in Geog. Journ., vi., Sept. 1895, pp. 205–227.

"The Hausa Territories": 1. "Hausaland," by the Rev. Chas. H. Robinson in Geog. Journ., viii., Sept. 1896, pp. 201–211. 2. "Notes on a journey through the Sokoto Empire and Bornu" in 1894, by W. Wallace, in Geog. Journ., viii., Sept. 1896, pp. 211–219.

"Nupe and Ilorin," by Seymour Vandeleur, Lieut. Scots Guards, in Geog. Journ., Oct. 1897, pp. 350–374.

"Colony of Lagos," by Sir Gilbert T. Carter in Proc. Roy. Col. Institute, xxviii., 1897; pp. 275–304.

"Travels in West Africa, Congo Français, Corisco and Cameroons," by Mary H. Kingsley; 743 pages (Macmillan & Co., Ltd., London, 1897).

"Tombouctou la Mysterieusé," by Felix Dubois; 420 pages, illustrated (E. Flammarion, Paris, 1897).

"The Personal Narrative of Lieut. Hourst of his Exploration of the Niger": Translated by Mrs. Arthur Bell (N. D'Anvers); 520 pages, with map and illustrations (Chapman & Hall, London, 1898).

"The Niger Sources and the Borders of the New Sierra Leone Protectorate," by Lieut.-Col. J. K. Trotter; 238 pages, with map and illustrations (Methuen & Co., London, 1898).

"In the Niger Country," by Harold Bindloss, 338 pages, with two maps (William Blackwood & Sons, Edinburgh and London, 1898).

"Notes on a Journey to Pali and Mamaidi in the Kingdom of Bauchi," by Percy A. Clive in Geog. Journ., xiv., Aug. 1899, pp. 177–183, with sketch-map of Bauchi.

"Regions of the Benue," by Lich H. Moseley in Geog. Jour., xiv., 1899, pp. 630–637, with map, p. 696, Western Dist. of the Benue River, and showing source of River Katsena.

"West African Studies," by Mary H. Kingsley; 633 pages, with three appendices:—

1. A short description of the Natives of the Niger Coast Protectorate, with some account of their Customs, Religion, Trade, etc., by M. Le Comte C.N. de Cardi; pages 443–566, with map of the Niger Delta.

2. A Voyage to the African Oil Rivers Twenty-five years ago, by John Harford, pp. 567–582. Pioneering in West Africa, or the opening up of the Qua Iboe River, by John Harford, pp. 583–611.

3. Trade Goods used in the early Trade with Africa as given by Barbot and other writers of the Seventeenth Century, pp. 612–633, with illustrations and maps (Macmillan & Co., London, 1899).

"Les Plantes Utiles du Sénégal: Plantes Indigènes et Exotiques," by Le R. P. A. Sébire, 341 pages, illustrated (J. B. Baillière et Fils, Paris, 1899).

"Dictionary of the Hausa Language," by Charles Henry Robinson, assisted by W. H. Brooks; vol. i. Hausa-English; vol. ii. English-Hausa (Cambridge University Press, 1899–1900—Third editions 1913–14.)

"La Côte d'Ivoire" (Paris Exhibition, 1900) by Pierre Mille, Commissaire de la Colonie; 31 pages, with map (Ministère des Colonies Paris, 1900).

"Une Mission au Sénégal," Ethnographie-Botanique-Zoologie-Géologie (Paris Exhibition, 1900), by MM. Dr. Lasnet, A Cligny, Aug. Chevalier & Pierre Rambaud; 348 pages, with a Bibliography by A. Chevalier of 72 works, pp. 258–263; map and numerous illustrations (Augustin Challamel, Paris, 1900).

"Sénégal-Soudan," Agriculture, Industrie, Commerce (Paris Exhibition, 1900), 124 pages (Augustin Challamel, Paris, 1900).

"British West Africa, its Rise and Progress," by Major A. F. Mockler-Ferryman; 512 pages, with maps and illustrations (Swan, Sonnenchein & Co., Ltd., London, 1900).

"A Short History of Sierra Leone," by Major J. J. Crooks; 214 pages, illustrated (The Nation Printing & Publishing Co., Dublin, 1900).

"The Sherbro and its Hinterland," by T. J. Alldridge; 356 pages (Macmillan & Co., Ltd., London, 1901).

"British Nigeria: A Geographical and Historical Description of the British Possessions adjacent to the Niger River, West Africa," from the earliest expeditions under Mungo Park to the punitive expeditions of 1902, by Lieut.-Col. A. F. Mockler-Ferryman; 351 pages, with illustrations and a map (Cassell & Co., London, &c., 1902).

"Botanical Enterprise in West Africa": a Series of printed letters (Jan. 17th, 1889–Sept. 30th, 1901)—Correspondence between the Colonial Office, the Governors of the West African Colonies and the Director of the Royal Gardens, Kew (printed officially; Colonial Office, May, 1902—Africa (West), No. 635); relating to Botanical and Forestry Matters in West Africa.

"The Aro Country in Southern Nigeria," by Capt. W. J. Venour in Geog. Journ., xx., 1902, pp. 88–89.

"Affairs of West Africa," by Edmund D. Morel; 382 pages, illustrated and map (W. Heinemann, London, 1902).

"Le Niger: Voie Ouverte à Notre Empire Africain," by Capt. Lenfant; 252 pages (Hachette, Paris, 1903).

"The Rise of British West Africa," by Claude George; 468 pages (Houlston & Sons, London, 1903).

"The Advance of our West African Empire," by C. Braithwaite Wallis; 318 pages, with illustrations and a map of the Sierra Leone Territories (T. Fisher Unwin, London, 1903).

"The Development of West Africa by Railways," by F. Shelford in Proceedings, Royal Colonial Institute, xxxv., 1903–04, pp. 248–280.

"The Gold Coast at the end of the Seventeenth Century under the Danes and Dutch, by Sir Matthew Nathan in Journal of the African Society, xiii., October, 1904, pp. 1–32.

"Historical Chart of the Gold Coast and Ashanti"; compiled from various sources, by Sir Matthew Nathan, loc. cit., pp. 33–43.

"Notes on the (Nembe) Brass Language," by Adebiyi Tepowa in Journal of the African Society, xiii., October, 1904, pp. 117–133.

"An Ibo Festival" (Owerri District), by A. A. Whitehouse in Journal African Society, xiii., October, 1904, pp. 134–135, illustrated.

"The Fulani Emirates of Northern Nigeria," by Major J. A. Burdon in Geog. Journ., xxiv., 1904, pp. 636–651.

"The White Man in Nigeria," by G. D. Hazzledine; 228 pages, with map and illustrations. A Study of present conditions and future prospects in Nigeria (E. Arnold, London, 1904).

"The Anglo-French Niger-Chad Boundary Commission," by Lieut.-Col. G. S. McD. Elliot in Geog. Journ., xxiv., 1904, pp. 505–524, with map, page 616.

"Northern Nigeria," by Brigadier-Gen. Sir F. D. Lugard in Geog. Journ., xxiii., 1904, pp. 1–29, with map, page 152.

"Nigeria," by Lady Lugard, in Journ. Soc. of Arts, lii., March 18th, 1904, pp. 370–384, with map.

"Die Deutsche Niger-Benue-Tsadsee Expedition, 1902–1903, by Fritz Baeur (Berlin, 1904).

"Notes on the Language of the Efa People, or the Bini, commonly called Uze Ado," by R. E. Dennett in Journal of the African Society, January, 1904, pp. 142–153.

"Lagos, Abeokuta and the Alake: The Colony and Protectorate of Lagos," by Sir William MacGregor in Journal of the African Society, xii., July 1904, pp. 464–481.

"Dutch and English on the Gold Coast in the Eighteenth Century," by Sir Matthew Nathan, in Journal of the African Society, xii., July 1904, pp. 325–351.

"West African Negroland," by Lady Lugard in Proc. Roy. Col. Institute, xxxv., 1904, pp. 300–326.

"Languages in Northern Nigeria," G. Merrick in Journ. African Society, October, 1905, pp. 43–47.

"A Tropical Dependency." An outline of the Ancient History of the Western Soudan, with an account of the Modern Settlement of Northern Nigeria, by Flora L. Shaw (Lady Lugard); 508 pages (Nisbet, London, 1905).

"Cross River Natives," by C. Partridge; 332 pages, with maps and illustrations (Hutchinson & Co., London, 1905).

"The Anglo-German Boundary Expedition in Nigeria, Yola to Lake Chad," by Col. Louis Jackson in Geog. Journ., xxvi., 1905, pp. 28–42, with map, page 128.

"Notices sur les Plantes Utiles ou Intéressantes de la Flore du Congo," by E. de Wildeman, Director of the Botanic Garden (Brussels, 1903–1905).

"Memoirs of West African Celebrities, with Special Reference to the Gold Coast," by the Rev. S. R. B. Attoh Ahuma (D. Marples & Co., Liverpool, 1905).

"Hausa Proverbs," by Capt. G. Merrick (Kegan Paul, Trench, Trübner & Co., London, 1905).

"Contribution to the History of the Hausa States," by A. Mischlich, with Introduction by J. Lippert in Journ. African Society, July, 1905, pp. 455–479.

"Liberia," by Sir Harry Johnston: with an Appendix on the Flora of Liberia by Dr. Otto Stapf; vol. i., 520 pages, vol. ii., pp. 521–1183, illustrated (Hutchinson & Co., London, 1906).

"At the Back of the Black Man's Mind: or Notes on the Kingly Office in West Africa," by R. E. Dennett; 288 pages, illustrated (Macmillan & Co., London, 1906).

"Reports on the Mineral Survey of Northern Nigeria, 1904–1905, by Prof. Dunstan; 24 pages (Col. Rep. Misc. Series, No. 32, 1906).

"Reports on the Mineral Survey of Southern Nigeria for 1903–4 and 1904–5," by Prof. W. Dunstan; 34 pages (Col. Rep., Misc. Series No. 33, 1906).

"Essais sur la Flore de la Guinée Française," by H. Pobeguin; 392 pages (1906).

"The Lower Niger and its Tribes," by Major A. Glyn Leonard, 559 pages, with maps (Macmillan & Co., London, 1906).

"West African Pocket Book." A guide for newly-appointed Government Officers, compiled by direction of the Secretary of State for the Colonies; 60 pages, illustrated, 2nd ed. (Waterlow & Sons, Ltd., London, 1906).

"The Structure of Southern Nigeria," by John Parkinson in Geog. Journ., Jan., 1907, pp. 56–64, with several illustrations and sketch-map.

"From the Niger by Lake Chad to the Nile," by Lieut. Boyd Alexander, in Geog. Journ., August, 1907, pp. 119–152.

"The Commercial Possibilities of West Africa," by the Right Hon. Viscount Mountmorres in Proc. Roy. Col. Institute, xxxviii. (1906–07), pp. 219–237. Also published by the Institute of Commercial Research in the Tropics, 24 pages (Liverpool University, 1907).

"Memorandum of the Taxation of Natives in Northern Nigeria," by Sir Frederick Lugard; 65 pages, with folded map (Col. Rep. Misc. Series, No. 40, 1907).

"La Mise en Valeur de l'Afrique Occidentale Française," by Henry Chevans, 280 pages (F. Alcan, Paris, 1907).

"Le Plateau Central Nigérien : Une Mission Archéologique et Ethnographique au Soudan Français." by Lieut. Louis Desplagnes; 504 pages with map and illustrations (E. Larose, Paris, 1907).

"The River Yo (or Waube) from Damjiri to Hadeija and Kano," by Lieut. H. Secker in Geog. Journ., xxx., 1907, pp. 438–440, with map reduced from a sketch-map of the survey.

"Widest Africa : An Account of the Country and People of Eastern, Central and Western Africa as seen during a Twelve Months' Journey from Djibuti to Cape Verde," by A. Savage-Landor, in 2 volumes—Chapter xviii (vol. ii) pp. 240–250 describes Lake Tchad (Hurst & Blackett, Ltd., London, 1907).

"A Short Vocabulary of the Fulani Language," by E. A. Brackenbury; 38 pages (Zungeru, 1907).

"Vocabulary of the Jukon Language," by K. Fraser; 38 pages (Zungeru, 1908).

"Gbari Grammar : Notes and Vocabulary," by Rev. W. P. Low; 18 pages (Zungeru, 1908).

"English-Okpoto Vocabulary," by Capt. F. W. Byng-Hall; 20 pages (Zungeru, 1908).

"Report on the Forest Administration of Southern Nigeria for 1906," by H. N. Thompson; 92 pages (Col. Report, Misc. Series, No. 51, 1908).

"Exploration in Southern Nigeria," by Lieut. E. A. Steel in Geog. Journ., xxxii., July, 1908, pp. 6–25, illustrated.

"Vom Atlantik Zum Tchadsee, Kriegs-und Forschungsfahrten in Kamerun," Von Hans Dominik (Berlin, 1908).

"From the Niger by Lake Chad to the Nile," by Boyd Alexander in Annual Report Smithsonian Institute (Washington), 1909, pp. 385–400.

"Africa and Its Exploration; as told by its Explorers"—Mungo Park, Clapperton, The Landers, Barth, Baikie, Burton, &c.; vol. i., 572 pages; vol. ii., 580 pages, with illustrations and maps (Sampson Low, Marston & Co., London, 1909?).

"We Two in West Africa," by Decima Moore and Major F. G. Guggisberg; 368 pages, with illustrations and maps (W. Heinemann, London, 1909).

"Les Végétaux Utiles de L'Afrique Tropicale Française," by Dr. Aug. Chevalier (Fasc. v. Première Étude sur les Bois de la Côte d'Ivoire); 314 pages (A. Challamel, Paris, 1909).

"A Grammar of the Gbari Language, with Gbari-English and English-Gbari Dictionaries," by Major F. Edgar; 374 pages (W. & G. Baird, Belfast, 1909).

"The Niger and the West Soudan : or, The West African's Note Book," by Capt. A. J. N. Tremearne; 150 pages (Hodder & Stoughton and Arthur Wheeler & Co., London, 1910).

"The Land of the Ekoi, Southern Nigeria," by P. A. Talbot in Geog. Journ., xxxvi., 1910, pp. 637–657; map, p. 752.

"The Yola-Cross River Boundary Commission, Southern Nigeria," by Major G. F. A. Whitlock in Geog. Journ., xxxvi., 1910, pp. 426–438.

"Delimitation of Boundary between Yola and the Cross River, 1907–9," by Lieut.-Col. G. F. A. Whitlock; including a "Geological Rport on the Nigerian-Cameroon Boundary, Yola to Cross River," by Lieut. W. D. Downes; 40 pages, with 2 maps (H.M. Stationery Office, London, Cd. 5368, 1910).

"Nigerian Studies," by R. E. Dennett; 235 pages, with illustrations and a map (Macmillan & Co., Ltd., London, 1910).

"A Transformed Colony: Sierra Leone, as it was and as it is: its Progress, Peoples, Native Customs and Undeveloped Wealth," by T. J. Alldridge; 368 pages, with illustrations and a map (Seeley, Service & Co., Ltd., London, 1910).

"Report on Forests, Gold Coast," by H. N. Thompson; 238 pages (Col. Report, Misc. Series, No. 66, 1910).

"Kanuri Readings," by P. A. Benton; 110 pages (Oxford University Press, London, 1911).

"A History and Description of the British Empire in Africa," by Sir H. H. Johnston; 430 pages, with maps and illustrations (National Society, London, 1910).

"Letters and Sketches from Northern Nigeria," by Martin S. Kisch (Chatto & Windus, London, 1910).

"Notes on the Botanical Resources of Yola Province, Northern Nigeria," by Dr. J. M. Dalziel in Kew Bull. No. 5, 1910, pp. 133–142.

"Notes on the Origin of the Filani," by Capt. A. J. N. Tremearne in Journ, Roy. Soc. Arts, lviii., June 17th, 1910, pp. 715–725.

"Anthropological Report on the Edo Speaking People of Nigeria," by N. W. Thomas, in 2 volumes (Harrison & Sons, London, 1910).

"Pioneers in West Africa," by Sir Harry Johnston; 336 pages, with sketch-maps and illustrations (Blackie & Son, London, 1911).

"The Opening up of Africa," by Sir H. H. Johnston; 256 pages (Williams & Norgate, London, 1911).

"The Geology and Geography of Northern Nigeria," by Dr. J. D. Falconer; 296 pages, illustrated (Macmillan & Co., London. 1911).

"Nigeria: Its Peoples and Problems," by E. D. Morel; 266 pages, illustrated (Smith, Elder & Co., London, 1911).

"The Making of Northern Nigeria," by Capt. J. W. Orr; 306 pages and maps (Macmillan & Co., London, 1911).

"Description Géologique des Régions situées entre le Niger et le Tchad et à l'Est et au Nord-Est du Tchad," by Dr. G. Garde; 284 pages (A. Herman et Fils, Paris, 1911).

"A Resident's Wife in Nigeria," by Constance Larymore; 300 pages (2nd ed., G. Routledge & Sons, London, 1911).

"The Agricultural and Forest Products of British West Africa," by G. C. Dudgeon; 170 pages, illustrated (John Murray, London, 1911).

"Notre beau Niger," by Felix Dubois; 299 pages, illustrated, and 2 maps (E. Flammarion, Paris, 1911).

"Litafi na Tatsuniyoyi na Hausa," by Major F. Edgar, in 3 volumes (Erskine Mayne, Belfast, 1911–1913).

"In the Shadow of the Bush," by P. Amaury Talbot; 500 pages (W. Heinemann, London, 1912).

"Northern Nigeria," by C. L. Temple in Geog. Journ., xl., 1912, pp. 149–168.

"L'Afrique Occidentale Française," by Louis Sonolet; 256 pages, with illustrations and a map (Hachette et Cie, Paris, 1912).

Haut-Sénégal-Niger (Soudan Français). "Séries d'études publiées sous la direction de M. le Gouverneur Clozel, ère série: Le Pays, les Peuples, les Langues, l'Histoire, les Civilisations," by M. Delafosse, in 3 volumes, with illustrations and maps (E. Larosse, Paris, 1912).

"Notes on some Languages of the Western Sudan," by P. Askell Benton; 304 pages (H. Frowde, London, 1912).

"Hausa Sayings and Folk-lore," by R. S. Fletcher; 176 pages (Oxford Univ. Press, London, 1912).

"The Gambia: Its History, Ancient, Mediæval and Modern," by H. F. Reeve; with maps and illustrations; 288 pages (Smith, Elder & Co., London, 1912).

"Nigeria and its Tinfields," by A. F. Calvert; 488 pages, with illustrations and maps (E. Stanford, London, 1912).

"The Tailed Head Hunters of Northern Nigeria," by Major A. J. N. Tremearne; 342 pages, illustrated (Seeley, Service & Co., Ltd., London, 1912).

"Report on the Results of the Mineral Survey of Southern Nigeria, 1910," by Prof. W. Dunstan; 14 pages (Col. Report, Misc. Series, No. 83, 1912).

"Twenty-five Years in Qua Iboe: The Story of Missionary Effort in Nigeria"; 170 pages, illustrated (Morgan & Scott, London, 1912).

"The Languages of West Africa," by F. W. H. Migeod; in 2 volumes (Kegan Paul, Trench, Trübner & Co., London, 1912–13).

"Alone in West Africa," by Mary Gaunt; 404 pages, illustrated (T. Werner Laurie, London, 1912).

"Report on the Afforestation of Togo with Teak and African Timber Trees," by Dr. A. H. Unwin; 13 pages (issued by the Crown Agents for the Colonies; printed by Waterlow & Sons, Ltd., London, 1912).

"A Vocabulary of the Mandingo Language as Spoken in the Gambia," by Dr. E. Hopkinson; 72 pages (West, Newman & Co. London, 1912).

"A Historical Geography of the British Colonies," by Sir C. P. Lucas: "West Africa," vol. iii. [1st ed., 1894; 2nd ed.,

1900]; revised to the end of 1912 by A. B. Keith; 434 pages, with 5 maps (Clarendon Press, Oxford, 1913).

"A West African Vade-Mecum: 'Verb Sap' on going to West Africa, Northern, Southern Nigeria and to the Coasts," by Alan Field; 252 pages (Bale, Sons & Danielsson, London, 2nd ed., 1913).

"The Sultanate of Bornu": translated from the German of Dr. A. Schultze, with Additions and Appendices, by P. Askell Benton; 402 pages (Oxford Univ. Press, London, 1913).

"Hausa Folk-lore," by R. S. Rattray, in 2 volumes (Clarendon Press, Oxford, 1913).

"Hausa Superstitions and Customs," by Major A. J. N. Tremearne; 548 pages, illustrated (Bale, Sons & Danielsson, Ltd., London, 1913).

"Anthropological Report on the Ibo-speaking Peoples of Nigeria," by N. W. Thomas, in 6 volumes, illustrated (Harrison & Sons, London, 1913—1914).

"Southern Nigeria: Some Considerations of Its Structure, People and Natural History," by A. E. Kitson in Geog. Journ., xli., 1913, pp. 16–38.

"From the Congo to the Niger and the Nile: An Account of the German Central African Expedition of 1910–1911," by Adolf Friedrich, Duke of Mecklenburg, in 2 volumes: Chapters on "The Lake Tchad District," "From Lake Tchad to the Niger" and the South Cameroons; illustrated (Duckworth & Co., London, 1913).

"A List of the Trees, Shrubs and Climbers of the Gold Coast, Ashanti, and the Northern Territories," by T. F. Chipp; 59 pages (Waterlow & Sons, Ltd., London, 1913).

"A Grammar of the Hausa Language," by F. W. H. Migeod; 229 pages (Kegan Paul, Trench, Trübner & Co., London, 1914).

"The Gold Coast and Its Dependencies—The Legend and the Reality," by Sir Hugh Clifford in United Empire: The Royal Colonial Institute Journal, v., August, 1914, pp. 622–646.

"A Hausa Phrase Book, with Medical and Scientific Vocabularies," by A. C. Parsons; 172 pages (Oxford Univ. Press, London, 1914).

"Through Unknown Nigeria," by J. R. Raphael; 361 pages (T. Werner Laurie, London, 1914).

"The Geographical Results of the Nigeria-Kamerun Boundary Demarcation Commission of 1912–13," by Capt. W. V. Nugent in Geog. Journ. xliii., June, 1914, pp. 630–651, with map, p. 730. —"The boundary demarcated by an Anglo-German Commission during the winter of 1912-1913 is that which lies between the village of Bayare, 30 miles south-west of Yola and the Customs Station of Obokum on the Cross River, the total length of this frontier measured from post to post is 360 miles."

"Health Preservation in West Africa," by Dr. J. C. Ryan; 96 pages (Bale, Sons & Danielsson, London, 1914).

"A Hausa Grammar, with Exercises, Readings and Vocabularies," by C. H. Robinson; 218 pages (Kegan Paul, Trench & Co., London, 1914).

"Notes on Nigerian Trees and Plants," by E. W. Foster; 69 pages (Biddle & Son, Haydon Place, Guildford, 1914).

"A List of the Herbaceous Plants and Undershrubs of the Gold Coast," by T. F. Chipp; 55 pages (Waterlow & Sons, Ltd., London, 1914).

"Specimens of Languages from Southern Nigeria," by N. W. Thomas; 144 pages, with sketch maps (Harrison & Sons, London, 1914).

"The Economic Resources of the German Colonies"; iii. "West African Colonies"—Cameroons, Togoland; Bull. Imperial Institute, xiii., 1915, pp. 392–422.

"A History of the Gold Coast and Ashanti," by W. W. Claridge, in 2 volumes (John Murray, London, 1915).

"The Trees, Shrubs, Herbs and Climbers of Sierra Leone," by C. E. Lane-Poole; 159 pages (Govt. Printing Office, Freetown, Sierra Leone, 1916).

"A Hausa Botanical Vocabulary," by Dr. J. M. Dalziel; 119 pages (T. Fisher Unwin, Ltd., London, 1916).

"Sierra Leone: Its Peoples, Products and Secret Societies," by H. O. Newland; 252 pages, illustrated (Bale, Sons & Danielsson, London, 1916).

"Anthropological Report on Sierra Leone," by N. W. Thomas, in 3 volumes (Harrison & Sons, London, 1916).

"Cultivation of Vegetables (European) on the Gold Coast," by A. B. Culham in "West Africa," Nov. 24th, 1917, pp. 716–717.

"Primer of Kanuri Grammar": Translated and Revised from the German of Herr a von Duisburg, by A. P. Benton (Oxford University Press, London, 1917).

"West Africa," from an address (King's College, Nov., 1917) on "The Development of Tropical Africa," by Sir H. H. Johnston in "West Africa," Nov. 24th, 1917, pp. 730–732.

"The Black Man's Part in the War," by Sir Harry Johnston; 127 pages, illustrated (Simpkin, Marshall, Hamilton, Kent & Co., Ltd., London, 1917).

"West African Folk Tales," collected and arranged by W. H. Barker & Cecilia Sinclair; 184 pages, illustrated (G. C. Harrap & Co., London, 1917).

"Early Days in Nigeria," and "The late Sir John Hawley Glover's Work in West Africa" (Lagos—as the first Governor (1863) and in the Campaign against the Ashantis), by Lady Glover in "West Africa," May 12th, p. 256; May 19th, p. 266; May 26th, p. 292; June 9th, p. 324; June 16th, p. 339 and June 23rd, 1917, pp. 356–357.

"The Cameroons," by A. F. Calvert, 92 pages, illustrated (T. Werner Laurie, Ltd., London, 1917).

"My Yoruba Alphabet," by R. E. Dennett (Macmillan & Co. Ltd., London, 1918).

"Sierra Leone Studies," edited by R. F. Honter & J. de Hart (Govt. Publishers, Sierra Leone, 1918).

"The Future of West Africa: Vital Questions, Specific Sanitation, Scientific Development and African Goodwill," by Dr. L. W. Sambon in "West Africa," August 3rd, 1918, pp. 439–448.

"Nigeria the Unknown"—A Missionary Text-book on Nigeria; 56 pages (Church Missionary Society, Salisbury Square, London, 1918).

"Thrice through the Dark Continent": A record of Journeyings across Africa during 1913–16, including Gold Coast, Cameroons, Munchi, &c., by the Rev. J. du Plessis: 350 pages, with illustrations and a map (Longmans, Green & Co., London, 1918).

"West Africa and the Fibre Industry," by Alfred Wigglesworth in "West Africa," April 6th, 1918, p. 150—this has special reference to "Jute" (*Corchorus capsularis*—see page 109).

"Native Races and their Rulers: Sketches and Studies of Official Life and Administration in Nigeria," by C. L. Temple; 252 pages, illustrated (Way & Co., Ltd., London, 1918).

"On Foot in West Africa," by Gertrude Benham in "West Africa," October 19th, 1918, p. 648; December 28th, 1918, p. 811.

"Togoland," by A. F. Calvert, 86 pages (T. Werner Laurie, London, 1918).

"Notes on the Tribes, Provinces, Emirates and States of the Northern Provinces of Nigeria"; compiled from Reports of O. Temple, edited by C. Temple; 578 pages (Argus Printing and Publishing Company, Cape Town, 1919).

"Report of a Conference between a Delegation from the Association of West African Merchants and the Union Coloniale Française" held in Paris, May 9–12th, 1919, by J. Pickering Jones in "West Africa," July 5th, 1919, pp. 527–534.

"West African Forests and Forestry," by Dr. A. H. Unwin; 527 pages, illustrated (T. Fisher Unwin, Ltd., London, 1919).

"Our Days on the Gold Coast: in Ashanti, in the Northern Territories and the British Sphere of Occupation in Togoland," edited by Lady Clifford; 314 pages, illustrated (John Murray, London, 1919).

"An Introduction to the Geography of Sierra Leone," by H. Michell; 128 pages, with maps (Waterlow & Sons, Ltd., London, 1919).

"Introductory Sketch of the Bantu Languages," by Alice Werner; 346 pages (Kegan Paul, Trench & Co., London, 1919).

"What to Read in and about West Africa," by Sir Harry Johnston in "West Africa," October 4th, 1919, p. 884.

"A Comparative Study of the Bantu and Semi-Bantu Languages," by Sir Harry H. Johnston; 812 pages (Clarendon Press, Oxford, 1919). This volume gives all the evidence available of 453 languages and dialects of Central, South, East and West

Africa. A second volume not yet (1921) in print analyses this evidence, &c.

"Agricultural Progress in Nigeria," by R. E. Dennett (Address at a meeting of the African Society) in "West Africa," May 31st, 1919, pp. 403–410.

"From Naraguta to Kano via Lake Chad by Motor" in "West Africa," March 8th, 1919, p. 112, with sketch-map of route by Capt. Lonsdale.

"With the Nigerians in German East Africa," by Capt. W. D. Downes, illustrated (Methuen & Co., Ltd., London, 1919).

"The Nigerian Handbook for 1919," compiled by A. C. Burns (Lagos, 1919); later edition (Govt. Printer, Lagos, 1921).

"The Gold Coast and the War," by Sir Charles Lucas; 56 pages (Humphrey Milford, London, 1920).

"The Republic of Liberia"—History, Commerce, Agriculture, Flora, &c., by R. C. F. Maugham; 296 pages, illustrated (George Allen & Unwin, Ltd., London, 1920).

"Exploration Botanique de l'Afrique Occidentale Française by Dr. M. Aug. Chevalier; Enumeration des Plantes Récoltées, avec une Carte botanique, agricole et forestière; 798 pages (Paul Lechevallier, Paris, 1920).

"Among the Ibos of Nigeria," by G. T. Basden; 316 pages, illustrated (Seely, Service & Co., Ltd., London 1920)).

"The Red Book of West Africa"—Historical, Descriptive, Commercial, &c., by Allister MacMillan; 312 pages, illustrated (W. H. & L. Collingridge, London, 1920).

"A Vanished Dynasty: Ashanti," by Sir Francis Fuller; 241 pages, with illustrations and a map (John Murray, London, 1920).

"The Gold Coast Regiment and the East African Cámpaign," by Sir Hugh Clifford; 306 pages (John Murray, London, 1920).

"The Cameroon," by L. W. G. Malcolm (an Address before the Royal Colonial Institute) in "West Africa," May 22nd, 1920, pp. 640-641.

"Colloquial Arabic: Shuwa Dialect of Bornu and of the Region of Lake Chad: Grammar and Vocabulary," by G. J. Lethem; 488 pages (Crown Agents for the Colonies, London, 1920).

"Handbooks prepared under the direction of the Historical Section of the Foreign Office, for British West Africa (general), Gambia, Sierra Leone, Gold Coast, Nigeria, Liberia, Togoland, Senegal, Ivory Coast, Dahomey, Cameroon, &c. (H.M. Stationery Office, London, 1920).

"Report by Sir F. D. Lugard on the Amalgamation of Northern and Southern Nigeria and Administration 1912–1919; 38 pages, with maps (H.M. Stationery Office, London: Cmd. 468, 1920).

"The Natives of the Northern Territories of the Gold Coast: their Customs, Religion and Folklo e," by A. W. Cardinall;

170 pages, illustrated (George Routledge & Sons, Ltd., London, 1920).

"The Report of the Committee on the Staffing of Agricultural Departments in the Colonies" (H.M. Stationery Office, London: Cmd. 730, 1920).

"West Africa the Elusive," by Alan Lethbridge; 321 pages, with illustrations and a map (John Bale, Sons & Danielsson, Ltd., London, 1921).

"The History of the Yorubas from the Earliest Times to the Establishment of the British Protectorate," by the Rev. S. Johnson, edited by Dr. O. Johnson (George Routledge & Sons, London, 1921).

"A First Grammar of the Adamawa Dialect of the Fulani Language (Fufulde)", by F. W. Taylor; 136 pages (The Clarendon Press, Oxford, 1921).

"A Visit to the Cameroons and Nigeria," by Capt. A. W. Hill, in Kew Bulletin, No. 6, 1921, pp. 225–253, including List of Plants collected in Northern Nigeria.

"A Contribution to the Flora of Northern Nigeria: Plants Collected on the Bauchi Plateau by H. V. Lely," J. Hutchinson in Kew Bull. No. 10, 1921, pp. 353–407.

"Pioneer Work in Nigeria: the Sokoto Gardens," by Rose Lamartine Yates in Journ. Roy. Hort. Soc., May, 1921, pp. 336–350, illustrated.

"The Romance of Ashanti," by Sir Francis Fuller in United Empire: The Royal Colonial Institute Journal, xii., No. 5, May, 1921, pp. 365–374.

"Geological Survey of Nigeria," by J. D. Falconer, Bulletin No. 1, "The Geology of the Plateau Tin Fields," with illustrations and a map (The Nigerian Government, 1921).

"A Vanished Dynasty, Ashanti," by Sir Francis Fuller; 242 pages, illustrated (John Murray, London, 1921).

Further reference is also suggested to the following periodicals, to all of which attention has already been drawn in the above pages.

Colonial Reports, Miscellaneous Series—special subjects and *Annual Series*—various subjects (H.M. Stationery Office, London); the *Government Gazettes* of the Gambia, Sierra Leone, Gold Coast and Nigeria; the *Geographical Journal* (Royal Geographical Society, London); the *Journal of the African Society* ("The African Society": founded in memory of Mary Kingsley; London); *West Africa*—issued weekly (Temple Bar House, Fleet Street, London); *United Empire—The Royal Colonial Institute Journal* (London); *Bulletin of the Imperial Institute* (John Murray, Albemarle Street, London); *Kew Bulletin of Miscellaneous Information* (H.M. Stationery Office, Imperial House, Kingsway, London); and *Reports of the Forestry and Agricultural Departments* of Sierra Leone, the Gold Coast and Nigeria.

INDEX

OF

ENGLISH, VERNACULAR AND BOTANICAL NAMES: PARTS I. to IV.

Aaha, 307.
Abaca, 674.
Abadan, 628.
Abaddina, 303.
Abahaca or Albahaca Cimarrona, 528.
Abaku, 422.
Abala, 699, 700.
Abalaja, 712.
Abana orfia, 691.
Abata Kola, 94.
Abatakola, 91.
Abba, 625, 634.
Abbak, 358.
Abbis, 302.
Abblay, 768.
Abe-dam, 736.
Abedam adibe, 735.
Abe-fita, 735.
Abe-fufa, 735.
Abekau Maru, 163.
Abeku, 423.
Abe-Ohene, 737.
Abeokuta bark, 51.
Abe Pa, 735.
Abere Oloko, 389.
Abe-tuntum, 736.
Abikolo, 385.
Ab Libben, 538.
Abo, 302, 429.
Abobo-be, 736, 738, 739.
Aboh, 429.
Abo-Idofun, 302.
Abo Kanran, 425.
Abontire, 430.
Abontosa, 297.
Abo-Ogea, 271.
Abore, 540.
Abo-Rere, 259.
Aborkpor or Aborpor, 424.
Aboro, 543.
Aboti, 509.
Abou Kamera, 263.
Abou Shendi, 263.
Abrin, 209.
Abru, 768.
Abrus precatorius, 209.
Aburu, 820.
Abu Surug, 286.
Abutilon asiaticum, 68.
—— Avicennae, 68, 111.
—— indicum, 68, 69.
—— periplocifolium, 67.
Acacia albida, 288.
—— arabica, 91, 288.
—— ataxacantha, 290.
—— campylacantha, 290.
—— Catechu, 290.
—— Dudgeoni, 291.
—— Farnesiana, 292.
—— Fistula, 296.
—— mellifera, 293.
—— Senegal, 91, 289, 293.
—— Seyal, 295.
—— Sieberiana, 296.
—— Verek, 293.
Acanthaceae, 514.
Acanthus montanus, 515.
Accra Copal, 272.
—— Niggers, 430.
Acha, 818.
Achilabri, 506.
Achras Sapota, 400, 401, 563.
Achyranthes aspera, 543.
Acom, 691.
Aconite-leaved Kidney Bean, 224.
Acoomoo, 558.
Ada, 842.
Adabi, 524.
Adadawa, 284.
Adansonia digitata, 85, 86, 274, 508.
Addah Niggers, 430.
Adder's Tongue, 881.
Adenanthera pavonina, 284.
Adenopus breviflorus, 329.
Aden Senna, 256.
Adere, 320.
Adesekanchie, 343.
Adesran, 735.
Adibe, 735.
Adja, 272.
Adjab, 418.
Ado, 178.
Ado Isehin, 239.
Adouggouari, 229.
Adrue, 760.
Adua, 138.
Adzuki, 227.

Aegle Barteri, 136.
Aeolanthus pubescens, 529.
Aerva lanata, 542.
Aeschynomene aspera, 200.
—— indica, 200.
Afara, 307, 651.
Affiogili, 664.
Affon or Affoo, 693.
Afia Edidia, 693.
Afoforo, 614.
—— Afe, 614.
Afoliafo akwoakuko, 703.
Afon or Affon, 640.
Aforwah, 584.
African Balsam of Copaiva, 271.
—— Bark, 353.
—— Bass, 725.
—— Bdellium, 141.
—— Blackwood, 238.
—— Bread Fruit, 640.
—— Cubebs, 554.
—— Cucumber, 333.
—— Elemi, 142.
—— Fan Palm, 729.
—— Fig, 343.
—— Greenheart, 284.
—— Grendilla-wood, 238.
—— Hemp, 700.
—— Honeysuckle, 710.
—— Kino, 239.
—— Lilac, 260.
—— Locust, 281.
—— Mahogany, 152, 153, 272, 277, 521.
—— Mammee Apple, 65.
—— Methonica, 711.
—— Myrrh, 141.
—— Oak, 139, 580.
—— Peach, 343.
—— Pepper, 50.
—— Piassava, 725.
—— Quinine, 343.
—— Rosewood, 239.
—— Silkworm, 579.
—— Sisal, 700.
—— Teak, 580.
—— Tragacanth, 90.
—— Tulip Tree, 510.
Afrormosia laxiflora, 248.
Afzelia africana, 272, 521.
—— bijuga, 520.
—— bracteata, 273.
—— cuanzensis, 273.
Aga, 641.
Aga-Igi, 283.
Agamobo, 515.
Agananmaigbo, 711.
Aganokwi, 418, 421.
Agave americana, 681.
—— fourcroydes, 684.
—— heteracantha, 683.
—— rigida var. elongata, 684.
Agave sisalana, 682.
Agbahdor, 768.
Agbahuyu, 402.
Agba-odo, 196.
Agbassy, 343.
Agbayun, 402.
Agbesi, 343.
Agbo, 50, 472, 507, 544, 558.
Agbon Igbo, 311.
—— Odon, 311.
—— Oludu, 729.
Agbo, omode, 444.
Agbo ommodo, 444.
Agbo pot, 96.
Agbourin Ilasa, 108.
Agelaea Lamarckii, 179.
Ageratum conyzoides, 381.
Aggar, 816.
Aghaghe, 303.
Agidi, 770.
Ago, 659.
Agodé, 737.
Agogoda Kome, 768.
Agogo Igun, 472.
Agoudé, 737.
Agra Hemp, 181.
Agriculture, 31.
Agropyron repens, 856.
Aguàcate, 567.
Aguah, 448.
Agugu, 881.
Aguirigui, 527.
Agumbogo, 776.
Ahedua, 269.
Ahkwehu, 232.
Ahon Ekun, 515.
Ahouai, 439.
Ahti, 236.
Ahuacate, 567.
Ahun, 443.
Aijlaun-mahaij, 583.
Ailb, 163.
Ainre-Bona-Bona, 297.
Aiya, 766.
Aiya-aiya, 766.
Ajagbon, 275.
Aja-Igi, 284.
Ajali-d'Jave, 418.
Aje, 425.
Ajebe, 581.
Ajejeh, 425.
Ajekofole, 591.
Ajeofole, 591.
Aji, 490.
Ajia, 266.
Aji picante, 490.
Ajo, 846.
Ajonjoli, 512.
Ajurr, 334.
Akake, 441.
Akam, 691.
Aka Natamame, 221.

Akanda, 463.
Akankan, 221.
Akankan tasi, 222.
Akan yunyun, 382.
Akar wangi, 807.
Akata, 440.
Akawn-Ekkun, 53, 515.
Akbo, 87.
Akbaha, 634.
Ake, 73, 437.
Akede, 617, 639.
Akee Apple, 167.
Akee Oil, 168.
Ake-iri, 68.
Akeko, 869.
Akese, 73, 76, 78.
Akesin-maso, 389.
Akhe, 436.
Akitipa, 518.
Akkaw-yunyun, 382.
Aklimawi, 794.
Akmalla, 389.
Ako, 274, 639, 724.
Ako-bolobolo, 106.
Ako Ejirin, 333.
Ako Idofun, 303.
Ako-Ire, 446.
Akoko, 509.
Akokola, 236.
Akomu, 558.
Akonge, 596.
Ako-Ogea, 271.
Akoos, 667.
Ako-rere, 260.
Akpakapakera, 225.
Akpako, 724.
Akpana, 693, 694.
Akpanagia, 240.
Akponojub, 735.
Akporojub, 735.
Akun, 455, 582.
Akund, 463.
Akwaerri, 436.
Akwuya, 802.
Alaffi, 263.
Alang Alang, 777.
Alankoawe, 157.
Alaphia landolphioides, 462.
—— sp., 462.
Albahaca, 527.
Albasar Kwadi, 680, 681.
Albassa, 705.
Albizzia anthelmintica, 297.
—— Brownei, 297.
—— fastigiata, 298.
—— Lebbek, 94, 299, 651, 655.
—— moluccana, 99.
—— rhombifolia, 300.
Alchornea cordata, 607.
Aledo, 165.
Ale Odan, 505.
Aleppo Grass, 796.
Aleurites triloba, 595.
—— moluccana, 595.
Alexandrian Senna, 256.
Alfalfa, Arabian, 186.
——, Guaranda, 186.
——, Oasis, 186.
——, Persian, 186.
——, Siberian, 186.
——, Turkestan, 186.
——, variegated, 186.
Algaroba, 262, 285.
Algodoncillo, 464.
Alguluar, 429.
Alhaji, 543.
Alhagi maurorum, 199.
Alibida Rubber, 437.
Aligna, 272.
Alimu, 157.
Alkama, 870.
Alkanet, 473.
Alkanna tinctoria, 473.
Al Khanna, 322.
Alkushi, 219.
Allam, 361.
Allamanda cathartica, 441.
—— —— var. Hendersonii, 441.
—— —— —— Schottii, 442.
—— neriifolia, 441.
Alleluba, 469.
Alleluia, 354.
Alleyfafu or Alayafu, 541.
Alligator Apple, 48.
—— Cacao, 98.
—— Pear, 567.
—— Pepper, 661, 662.
Allium ascalonicum, 705.
—— Cepa, 705.
—— sativum, 708.
Alloba, 293.
Allspice, 317.
Almeidina, 576, 577.
Almendro, 306.
Almond, Fijian, 306.
——, Indian, 306.
——, Tropical, 306.
——, Wild, 306.
Aloa, 830, 831.
Aloe, 700.
Aloe or Aloes vert, 686.
Aloe Barteri, 704.
Aloes, 704.
——, Cape, 705.
——, S. African, 705.
Alo Iganyan, 693.
Alouk, 296.
Alouki, 296.
Alstonia, congensis, 443.
—— scholaris, 444.
Alternanthera achyranthoides, 543.
Alu, 156.
Alukerese, 480.
Alum, 361.

Alupaida, 207.
Alupayida, 207.
Alysicarpus rugosus, 207.
Amabile, 844.
Amadiboubon, 793.
Amaltas, 257.
Amaltash, 257.
Ama Papu, 437.
Amara, 688.
Amarantaceae, 539.
Amaranth, Annual Globe, 544.
——, Green, 540.
——, Prickly, 542.
——, Wild, 540.
Amaranthus Blitum, 540.
—— caudatus, 541.
—— polygamus, 541.
—— spinosus, 541.
—— viridis, 542.
Amargosa, 333.
Amarsk, 768.
Amaryllideae, 680.
Amatungula, 438.
Ambari Hemp 70, 181.
Ambash, 199.
Ambasi Hemp, 70.
Ambatch, 199, 463, 765.
Ambona, 608.
Ambrevade, 236.
Ampelocissus, 163, 164.
Ambrevate, 236.
Ambrosie, ou thé du Mexique, 541.
Ameh Osehbeh, 480.
Amelliki, 343.
Amendoas de Disanha, 640.
American Coffee Berry, 211.
—— Mangrove, 304.
—— Nutmeg, 51.
—— Senna, 256.
—— Sumach, 250.
—— Wormseed, 545.
Amoiya, 641.
Amomum angustifolium, 661.
—— Granum-Paradisi, 661.
—— latifolium, 662.
—— Melegueta, 662.
Amot-tumaga, 260.
Ampalia, 333.
Ampelideae, 163.
Amphiblemma cymosum, 321.
Amphilophis glabra, 808.
—— intermedia, 808.
—— —— var. acidula, 808.
—— pertusa, 809.
Amunimuye, 391.
Amukai, 74.
Amureji, 197.
Ana, 288.
Anacardiaceae, 168.
Anacardium occidentale, 175.
Anainguéri, 421.
Anamamy, 484.
Anamdrambo, 390.
Anamafana, 389.
Anamalaho, 389.
Ananas sativus, 676.
Anaoso, 249.
Anapatza, 542.
Anaphe infracta, 579.
Anaphe Moloneyi, 267.
Anaphrenium abyssinicum, 168.
Anchomanes Dalzielii, 755.
—— dubius, 755.
Ancistrophyllum secundiflorum, 727.
Andakehi, 526.
Andande, 776.
Andanandua, 510.
Andes Cotton, 79.
Andropogon apricus, 809.
—— —— var. africana, 809.
—— auctus, 814.
—— ceresiaeformis, 815, 816.
—— citratus, 810.
—— contortus, 816.
—— diplandrus, 815.
—— Dregeanus, 814.
—— exilis, 809.
—— gayanus, 809.
—— —— var. bisquamulatus, 809.
—— —— —— genuinus, 809.
—— —— —— squamulatus, 809.
—— halepensis, 796.
—— intermedius, 808.
—— muricatus, 806, 808.
—— Nardus, 812.
—— pertusus, 808, 809.
—— punctatus, 808.
—— pseudapricus, 809.
—— rufus, 814.
—— Ruprechtii, 814.
—— Schoenanthus, 813.
—— Sorghum, 791, 792, 800, 801, 804, 805, 806.
—— —— var. sudanensis, 800.
—— —— —— Vogelianus, 801.
—— —— —— vulgaris, 801.
—— squarrosus, 806.
—— tectorum, 810.
Aneilema beniniense, 712.
Angea, 383.
Ango, 705.
Angolan Mandubi, 232.
Angola Pea, 236.
Anguilla, 512.
Anikiba, 352.
Anil, 192.
Anilis, 192.
Ankolib, 788.
Annotto, 57.
Annual Capsicum, 490.
—— Globe Amaranth, 544.
—— Pepper, 490.
Anogeissus leiocarpus, 308.
Anomani, 618.

Anonaceae, 47.
Anona Cherimolia, 47.
—— muricata, 48.
—— palustris, 48.
—— reticulata, 48.
—— senegalensis, 48.
—— squamosa, 49.
Ano Yayagan, 853.
Antaque, 235.
Antheraea Paphia, 306.
Anthistiria ciliata, 817.
—— glauca, 817
—— imberbis, 817, 818.
Anthocleista, nobilis, 469.
Antiaris africana, 639.
Anyo, 453.
Apa, 272.
Apado, 266.
Apam, 359.
Apaon, 298.
Apa oro, 469.
Apapa, 327.
Apapo, 246.
Apara, 280.
Aparan, 469.
Apepe, 239.
Apikan, 353.
Apocynaceae, 428.
Aporo, 524.
Apple, African Mammee, 65.
——, Akee, 167.
——, Alligator, 48.
——, Balsam, 333.
——, Broad-leaved Star, 398.
——, Cashew, 175.
——, Custard, 48, 49.
——, Devil's, 494.
——, Downy Thorn, 493.
——, Guava, 315.
——, Guayaquil Thorn, 493.
——, Jew's, 483.
——, Mad, 494.
——, Malay, 320.
——, Milk, 400.
——, Mummy, 328.
——, Monkey, 48, 148.
—— of Peru, 494.
——, Rose, 319, 369.
——, Star, 398.
——, Sugar, 49.
——, Thorn, 494.
——, -wort, Smoke, 494.
Apuru, 301.
Ara, 239.
Arabian Coffee, 362.
—— Cotton, 77.
Arache, 279.
Arachi, 272.
Arachis hypogaea, 201, 202, 456, 643, 779.
Arrack, 427.
Aragbahi, 359.
Arak, 427.
Araliaceae, 342.
Aramamila, 607.
Aramina, 68, 69, 111.
Aramoho, 529.
Ararabi, 526.
Arasa, 579.
Arbre à Soie du Sénégal, 463.
Arbre au diable, 612.
Arbre Sacré, 281.
Areca Catechu, 663, 712.
—— Nut Palm, 712.
Arenga saccharifera, 713.
Arere, 105.
Argemone mexicana, 53.
Arghesana, 508.
Argosee, 336.
Arguah, 448.
Aribedda, 437.
Aridan, 285.
Aridan toro, 260.
Arinigo, 584.
Aristida Adscensionis, 848.
—— depressa, 849.
—— stipoides, 849.
Aristolochia albida, 551.
—— bracteata, 552.
—— elegans, 552.
—— Goldieana, 552.
—— Serpentaria, 552.
Aristolochiaceae, 551.
Arka, 463.
Armoreira, 617.
Arnatto, 57.
Arnebia hispidissima, 473.
—— tibetana, 473.
Aro agbe, 390.
Aroba, 303.
Arobo, 430.
Arogu, 49.
Arojoku, 385.
Aromo, 292.
Arrow Poison, 448, 449.
Arrowroot, Bermuda, 668.
——, Brazilian, 601.
——, Fiji, 688.
——, Indian, 668.
——, Queensland, 670.
——, St. Vincent, 668.
——, South Sea, 688.
——, Tacca, 688.
——, West Indian, 668.
Artar, 121.
Artarine, 122.
Artemisia Judaica, 390.
Artichoke, 388.
——, Jerusalem, 388.
Artocarpus incisa, 642.
—— integrifolia, 368, 556, 644.
—— nobilis, 645.
Arundinaria alpina, 879.
Arundo Donax, 847, 848.

Arundo Phragmites, 847.
Arunyeran, 583.
Asagao, 480.
Asagidi, 579.
Asclepiadeae, 462.
Asclepias curassavica, 464.
—— gigantea, 463.
—— lineolata, 465.
—— physocarpa, 465.
—— procera, 463.
—— semilunata, 465.
Asgandh, 489.
Asgundh, 489.
Asha or Arasha, 578.
Ashantee Pepper, 554.
Ashorr, 463.
Ash Pumpkin, 332.
Asiadua, 269.
Asinipalla-Kai, 645.
Asiri, 578.
Asofeyeje, 628.
Asofeyeye, 441.
Asogbodum, 356.
Asogejub, 736, 738.
Asoma, 590.
Asparagus Bean, 229.
Asparagus Bush, 703.
Aspilia latifolia, 385.
Assam Rubber, 623.
Assan, 641.
Assarbah, 402.
Assawansah, 554.
Astragalus gummifer, 91.
Ata, 121.
Ata-Eiye Sisebe, 490.
Ata Gbasejo, 490.
Ata jige, 490.
Ata jije nla, 490.
Ataku main-ya, 766.
Atara, 91.
Atawah, 280.
Atcha Grain, 819.
Ater, 208.
Atewo Edun, 479.
Athawah, 280.
Athlak, 525.
Ati, 265.
Ati-fufu, 431.
Atombo, 475.
Atont, 240.
Atore, 151.
Atori, 116.
Atorin, 116.
Atta Beans, 280.
Attadina, 303.
Attahre, 662.
Attifufu, 431.
Attora, 836.
Aubergine, 483.
Aubrya gabonensis, 121.
Augor, 724.
Auricula tree, 463.
Australian Asthma Herb, 573.
—— Red-top, 839.
Ausuku, 736.
Aviangti, 509.
Avicennia africana, 527.
Avocado Pear, 567.
Awaiyo, 626, 634.
Awama, 590.
Awasa, 579.
Awe, 148.
Awenu, 246.
Awere pepe, 389.
Awewi, 247.
Awin, 261.
Awkpawtaw, 619.
Awomah, 590.
Awon-Ekun, 75.
Awuje, 225.
Awun, 443.
Awusa, 611.
Axonopus compressus, 823.
Aya, 761.
Ayaba, 671.
Ayada, 508.
Ayali-noungou, 418.
Ayanre, 298.
Ayara Buvana, 737.
—— Mbana, 737.
Ayarambana Eyop, 738.
Ayeye, 353.
Ayin, 308.
Ayinre, 297.
Ayinre Langara, 300.
Ayinre ogo, 298, 300.
Ayinreta, 298.
Ayinretta, 298.
Ayo, 115.
Aza, 166.
Azamara, 167.
Azote-caballo, 518.
Azuigwa or Azaigwe, 537.
Azure Convolulus, 480.

Baa, 272.
Babanus, 237.
Babba juji, 537.
Baberka, 391.
Babool, 289.
Babool Gum, 289.
Bacco Nut, 423.
Bachelors' Buttons, 544.
Baco, 422.
Badamier, 306.
Badamier de Malabar, 306
Badi, 343.
Ba-Fillatani, 820.
Bafureira, 146, 608.
Bagamma, 260.
Bagarua, 288.
Bagasse, 780, 781.

Bagauro, 593.
Bag-berenda, 593.
Baggarua, 288.
Bagu, 295.
Baggui, 296.
Bahama Grass, 855.
Bahay Casa, 284.
Bahia, 346.
Baia or Baya, 833.
Baikiaea insignis, 276.
Baina, 833.
Bajra, 844.
Bakam Wood, 252.
Baki-Bunu, 192.
Bakin rakumi, 795.
Baku, 422.
Bakum Mahogany, 421.
Bakunin, 443.
Bala, 280.
Balai-doux, 506.
Balan, 520.
Balan balan, 496.
Balanites aegyptiaca, 138.
Balanophoreae, 571.
Balasa or Balasaya, 711.
Balata, 415, 416, 634, 637.
Balata, Native, 635.
Balatang, 226.
Balatongaso, 259.
Balisier des Indes, 670.
Ballata, 630.
Bal leaves, 93.
Baloon Vine, 165.
Balogos, 57.
Balones, 282.
Balsam Apple, 333.
—— Copaibi, 270.
—— Copaivi, 270.
——, Ilorin, 271.
—— Pear, 333.
Balsamina, 333.
Balsamodendron africanum, 140.
Bamambeh, 463.
Bambammi, 607.
Bambarra Ground-nut, 231, 232.
Bamboo, Berry Bearing, 878.
——, Male, 876.
——, Manna, 877.
—— Palm, 724.
——, Solid, 876.
——, Spiny, 878.
Bambouk butter, 410.
Bambuk, 410.
Bamburrua, 854.
Bambusa arundinacea, 878.
—— polymorpha, 878.
—— vulgaris, 879.
Bamtaki, 312.
Banaba, 321.
Banana, 94, 671.
——, Canary, 670.
——, Chinese, 670.
Banana, Costa Rica, 671.
——, Dwarf, 670.
——, "Gros Michel," 671.
——, Jamaica, 670, 671.
——, Pea, 218.
—— Stock Pea, 218.
Banga, 430.
Bangbi, 260.
Bangi, 279.
Bangue, 614.
Banjam, 469.
Bankul, 595.
Bano, 289.
Banochra, 68.
Bantamare, 259.
Bantang foro, 443.
Bantschi, 600.
Baobab, 85.
Baphia nitida, 242, 246, 795.
—— pubescens, 247.
Bara banankou, 600.
Barabutu, 642.
Barane, 593.
Bara Oulé, 311.
Baraz, 236.
Barbados Flower Fence, 251.
—— Pride, 251.
Barbaji, 357.
Bareet Grass, 869.
Bark, Abeokuta, 51.
——, African, 353.
——, Calisaya, 349.
——, Cantar, 51.
——, Casca, 279.
——, Crown, 350.
——, Diabetes, 176.
——, Druggists', 351.
——, False Angostura, 467.
——, Jesuit's, 350.
——, Kanda, 51.
——, Ledger, 349.
——, Loxa, 350.
——, Manufacturers', 351.
——, Ordeal, 279.
——, Pale, 350.
——, Peruvian, 350.
——, Red, 350.
——, Sassy, 279.
——, Yellow, 349.
Barkom, 490.
Barley, Pearl, 774.
Barowre, 626.
Barricarri, 209.
Barsalo, 661.
Baru, 796.
Barwood, 241, 242, 243, 247, 796.
Basal-el-Unsal, 709.
Basatum, 737.
Basel-el-far, 709.
Basella alba, 545.
Bashful Mimosa, 287.
Basil, Common, 527.

Basil, Hoary, 528.
——, Sweet, 527.
Basilic commun, 528.
Basilic d'Amerique, 528.
Bassa Bassa, 452.
Bassalo, 661.
Bassia butyracea, 409.
—— latifolia, 418.
Bass, Lagos, 725.
——, African, 725.
Bassine, 730.
Bastard Cedar, 145.
—— Ipecacuanha, 464.
—— Jute, 70.
—— Meligetta, 661.
—— Millet, 827.
—— Saffron, 392.
—— Teak, 222.
—— Vervain of Jamaica, 518.
Batabata, 524.
Bate-bate, 537.
Bathmartiger Tabak, 496.
Batiator, 380.
Batjitjor, 380.
Batoko Plum, 59.
Batui, 240.
Batwi, 240.
Bauderi, 853.
Bauhinia diphylla, 266.
—— Megalandra, 266.
—— purpurea, 266.
—— reticulata, 263, 457, 458, 530.
—— rufescens, 264.
—— tomentosa, 265.
—— variegata, 265.
Bauraira, 710.
Baure, 627.
Baurin Kiashi, 633.
Bau-sau, 330.
Bay, 316.
Baya, 345.
Bayag, 249.
Bayan mariya, 815.
Bay, Citron-smelling, 316.
Bayog, 282.
Bayogo, 282.
Bay Rum, 317.
—— Rush, 601.
——, West Indian, 316.
Bazazula, 79.
Bdellium, African, 141.
——, Le Baumier, 141.
Be, 836.
Beacon Bush, 161.
Bead Tree, 145.
Beads, Prayer, 209.
Bean, Aconite-leaved Kidney, 224.
——, Asparagus, 229.
——, Atta, 280.
——, Bengal, 217.
——, Black Mauritius, 217.
——, Boston baked, 228.
Bean, Burma, 225.
——, Butter, 225.
——, Calabar, 221, 224.
——, Carob, 262.
——, Catiang, 229.
——, Catyang, 229.
——, China, 211.
——, Congo, 236.
——, Cuba, 229.
——, Duffin, 225.
——, Florida Velvet, 218.
——, Foreign, 201.
——, Four winged, 234.
——, French, 227.
——, Goa, 234.
——, Haricot, 227.
——, Horse, 221, 253.
——, Horse-eye, 221.
——, Hyacinth, 235.
——, Indian Butter, 235
——, Java, 225.
——, Kidney, 227.
——, Lablab, 235.
——, Lima, 225.
——, Locust, 262.
——, Lyon, 219.
—— —— Velvet, 219.
——, Manchurian, 229.
——, Matchbox, 282.
——, Mauritius, 217.
——, Mesquit, 285.
——, Molucca, 249.
——, Moth, 224.
——, Ordeal, 224.
——, Overlook, 221.
——, Ox-eye, 221.
——, Paigya, 225.
——, Patagonian, 221.
——, Poor Man's, 235.
——, Rangoon, 225.
——, Rice, 229.
——, Sea, 282.
——, Seyanos, 201.
——, Short-podded Yam, 232.
——, Small Mauritius, 225.
——, Snake, 221.
——, Snuffbox, 282.
——, Soja, 211.
——, Soy, 211, 800.
——, Starch, 233.
——, Sugar, 225.
——, Sword, 221, 282.
——, Tonga, 235.
——, Velvet, 218.
——, West African Locust, 281.
——, Yam, 233.
Beaumontia grandiflora, 451.
——, Large flowered, 451.
Bechna, 793.
Bediwonua, 277.
Beefwood, 650.
Beetroot, 546.

Beet-y-diau, 482.
Bei, 264.
Bejuco de Conchitas, 210.
Bekili, 300.
Bele, 153.
Belgaume Nut, 595.
Beligbele, 277.
Bella Sombra, 550.
Belle de Nuit, 537.
Bellenda, 353.
Bell Pepper, 491.
Belongu, 511.
Bembe, 490.
Bembee, 353.
Bempé, 421.
Bena, 807.
Bendi-Kai, 71.
Bendwi, 246.
Béné, 512.
Benefing, 534.
Bengal Bean, 217.
—— Gram, 207.
—— Grass, 834.
—— kino, 222.
Bengdé, 433.
Beng Dhoondool, 331.
Beni, 511.
Benincasa cerifera, 332.
Benifalu, 811.
Benin Mahogany, 146, 152, 154.
Beniseed, 512.
Benti, 374.
Benzor Nut, 249.
Ber, 161.
Beraf, 336.
Berberinoa, 854.
Bergamot Oil, 123.
—— Orange, 123.
Beri-Beri, 862.
Berkoma, 490.
Berlinia acuminata, 266.
—— —— var. Heudelotiana, 266.
—— paniculata, 267.
Bermuda Arrowroot, 668.
—— Grass, 823, 824, 825, 829, 855, 856.
Berry, American Coffee, 211.
—— Bearing Bamboo, 878.
—— Capsicum, 490.
——, China, 145.
—— Myrtle, 316.
Berseem, 187.
Beru, 619.
Besenna, 297.
Bessekoje, 699.
Beta vulgaris, 546.
Betel Nut Palm, 712.
—— Oil, 553.
—— Palm, 663, 712.
—— Pepper, 197.
Betle Pepper, 553, 712.
Betu, 138.
Betu Oil, 138.
Beuji, 628.
Beurre et le Pain d'O'Dika, 138.
—— de Galam, 410.
—— de Karité, 410.
Bezr senna Mukkee, 258.
Bhang, 614.
Bhere, 161.
Bhumichekri Gadde, 479.
Bibi, 157.
Bidens pilosa, 389.
Bienyabura, 201.
Bigarade Orange, 122.
Bignoniaceae, 507.
Bihi, 429.
Bihimitrou, 558.
Bijaje, 631.
Bikhonda, 796.
Bilaikand, 479.
Bilberry, 488.
Bilbila, 384.
Billet Wood, 424.
Bilor, 199.
Bimba, 199.
Bimlipatam Jute, 70, 111.
Binda, 330.
Bindweed, Egyptian, 480.
Bi-ni-da-zugu, 593.
Bintipobon, 433.
Biophytum sensitivum, 121.
Bird Pepper, 490.
Birgou, 831.
Biriji, 201.
Birijin liam, 324.
Bisagazi, 841.
Bissess, 425.
Bi-ta-ka-tsira, 360.
Bitter Cassava, 601.
Bitter Grass, 824.
—— Kola, 63, 64.
—— leaf, 379.
—— Orange, 122.
—— Senat, 334.
Bitters Tree, 381.
Bixa Orellana, 57, 593, 655.
Bixineae, 57.
Biye-rama, 185.
Black Camwood, 244.
—— Cinnamon, 316.
—— Datura, 492.
—— Ebony, 424.
—— Grain, 256.
—— Gram, 207.
—— Jack, 389.
—— Mauritius Bean, 217.
—— Mulberry, 616.
—— Plum of Sierra Leone, 525.
—— Run Palm, 729.
—— -seeded Cotton, 80.
—— Subar, 310.
—— Tamarind, 261.
—— Thorn, 292.

Blackwood, African, 238.
——, China, 238.
——, West African, 238.
Blady Grass, 777.
Blé Sarrasin, 550.
Blessed Thistle, 392.
Blighia sapida, 167.
Blippo, 356.
Bloodflower, 464.
Blood Orange, 123.
—— Plum, 177.
Blue American Ipomea, 480.
—— Gum, 313.
—— Mountain Coffee, 362.
—— Pea, 210.
Blumea aurita, 384.
—— lacera, 383.
Boala, 280.
Boange, 334.
Bobai, 297.
Bobi, 497.
Boboawodi, 482.
Boehmeria nivea, 646.
—— —— var. tenacissima, 647.
Boekenhout, 569.
Bœre, 236.
Boerhaavia adscendens, 537
—— plumbaginea, 538.
—— repens, 538.
—— —— var. diffusa, 538.
Boer Manna. 837.
Boerowé, 415.
Bofi, 639.
Bois d'Anisette, 558
—— de Bahia, 346.
—— de l'Inde, 316.
—— de Sureau, 165.
—— Immortel, 98.
—— immortelle, 216.
—— Sophie, 287.
Boja, 282.
Bokboi, 474.
Bokin-Doka, 267.
Bokombola, 280.
Bokumake, 285.
Bolela, 288.
Bolletree, 415.
Bolo-bolo, 108.
Bolondo, 283.
Bolong, 65.
Bolongi, 545.
Bolu, 859.
Bombambo, 641.
Bombardeira, 463.
Bombax buonopozense, 86, 87.
—— pentandrum, 87.
—— reflexum, 87.
Bombay Senna, 256.
Bombomu, 463.
Bombor, 517.
Bonavist, 235.
Bonding aling, 421.
Bondue Nut, 249.
Bongbo, 260.
Boni, 823.
Bonkori, 774.
Bonnet Gourd, 331.
Bonni, 292.
Boo, 271.
Books and Papers, List of, 833.
Boomah, 611.
—— Nut, 612.
Booroondi, 472.
Boraginaceae, 469.
Borassus flabellifer, 728.
—— —— var. aethiopum, 728.
Bore, 482.
Borfroko, 700.
Borgou, 831.
Borneo Teak, 519.
Boro ni papalagi, 490.
Bosambi, 582.
Bosanga, 430, 657.
Boscia senegalensis, 55.
Boscogna, 275.
Bosso, 838.
Boston-baked Beans, 228.
Boswellia Dalzielii, 526.
—— odorata, 526.
Botany, 16.
Botanic Gardens, 24.
—— ——, Lagos, 24.
—— ——, Old Calabar, 24.
—— ——, Oloke-Meji, 28.
Botije, 593.
Bottle Gourd, 330.
Bougainvillea spectabilis, 539.
Boukon, 774.
Bourane, 279.
Bourghoumy, 538.
Bowstring Hemp, 698, 700.
Brachiaria distichophylla, 821.
—— fulva, 822.
—— mutica, 822.
Brachystegia appendiculata, 274.
—— longifolia, 275.
—— spicaeformis, 273.
—— tamarindoides, 274.
Braham, 796.
Brainvillière, 469.
Brank, 550.
Brazilian Arrowroot, 601
—— Stink Grass, 840.
—— Wood, 252.
Brea, 143.
Bread, Dika, 137.
—— Fruit, 642.
—— —— African, 640.
—— ——, Entire-leaved, 644
—— ——, Wild, 645.
—— Nut, 642.
——, St. John's, 262.
Bread-zaad, 825.
Bridelia atroviridis, 578.

Bridelia micrantha, 579.
—— scleroneura, 580.
Brillantaisia Lamium, 515.
Brimstone, 375.
—— Tree, 374.
—— Wood, 308, 375.
Brinjal, 483.
Bris Chien, 398.
Bristly-leaved Corchorus, 115.
Broad-leaf Tobacco, 498.
Broad-leaved Star Apple, 398.
Brochea, 509.
Broke-Back, 156.
Bromeliaceae, 676.
Broom, 506.
—— Corn, 789, 835.
Broso, 327.
Broussonetia papyrifera, 651.
Brown Cluster Rubber, 431.
—— Medium Rubber 431.
—— Corn Millet, 835.
—— Durra, 794.
—— Hemp, 181.
Bu, 271.
Buaiteran, 390.
Buaji, 177.
Buak Ketapang, 306.
Buaze fibre, 59.
Bubalinabo, 271.
Bubo-bubo, 68.
Buboi, 452, 453.
Bubuchi, 836.
Bucare, 216.
Buchnera leptostachya, 507.
—— longifolia, 507.
Buckwheat, 550.
Buddari, 853.
Buffalo Grass, 767, 822, 828.
—— Thorn, 162.
Buffel-grass, 838.
Bugulli, 688.
Bugumbo, 465.
Bugumji, 530.
Buica, 530.
Buje, 356, 359.
Buje dudu, 356.
Buje-nla, 356.
Buji, 356.
Bukike, 210.
Bukul, 420.
Bullet Wood, 416.
—— Tree, 415.
Bull Oak, 650.
Bullock's Heart, 48.
Bully Tree, 399, 400, 415.
Bulrush Grass 802.
—— Millet, 844.
Bultuc, 844.
Bumbo, 270, 374.
Bumpago, 303.
Bunch Spear Grass, 816.
Bundin Kurege, 849.
Bundoi, 246.
Bungbo, 270, 374.
Bunghama, 523.
Bungi, 397.
Bungo, 270.
Bunsurundaji, 816.
Buol, 705.
Buona Vista, 235.
Burburwa, 854.
Bur Grass, 846.
Burgu, 831.
Burgundy Trefoil, 186.
Burkea africana, 278.
Burma Haricot, 234.
—— Teak, 519.
Burr, 870.
Burro Kooksina, 383.
Burseraceae, 140.
Burué, 415.
Burueh, 415.
Bus, 847.
Busbas, 490.
Bush Beacon, 161.
—— Coffee, 367.
——, Milk, 440.
——, Milky Cotton, 464.
——, Salt, 427.
——, Wildfire, 494.
——, Wild Tea, 536.
Busl, 705.
Butah, 330.
Butea frondosa, 222.
—— Gum, 222.
Butter, Bambouk, 410.
—— Beans, 225.
——, Shea, 410.
—— tree, 63, 409.
Button Wood, 308.
Butusa, 422.
Butyrospermum Parkii, 410, 418, 630.
Bwemba, 275.
Bwenga, 190.
Byrsocarpus coccineus, 178.
—— orientalis, 179.
—— venulosa, 179.
Byssi, 91.

Cabellero, 251.
Cabalonga, 439.
Cabará-caá, 516.
Cabella, 50.
Cabende, 613.
Cablan, 535.
Caboboad, 487.
Cabra, 614.
Cacao, 96.
——, Tiger, 98.
——, Alligator, 98.
Cacaouette, 201.

Cachao, 558.
Cachinde ca menha, 518.
Cacoon, 282.
Cacoucia paniculata, 310.
Cadaba farinosa, 55.
Cadinga puna, 396.
Cadios, 236.
Cadius, 236.
Caesalpiniae, 249.
Caesalpinia Bonducella, 249.
—— coriaria, 250.
—— pulcherrima, 251.
—— Sappan, 252.
Caesar Weed, 68.
Café de Soudan, 281.
—— Marron, 259.
—— Nègre, 259.
Caffé, 259.
Cafoto, 196.
Caguios, 236.
Cahémbia-hémbia, 67.
Caiala camoxe, 207.
Cail, 153.
—— -Cedra, 153.
Caimitier, 398.
Cainito, 398.
Cajanus indicus, 99, 236, 368.
Cajlee, 210.
Cajueiro, 175.
Calabacita cimerrona, 338.
Calabar Bean, 221, 224.
Calabash, 330.
—— Gourd, 330, 338.
—— Nutmeg, 51.
——, Pipe, 330.
—— tree, 507.
Caladium bicolor, 757.
Calalu, Garden, 542.
——, Green, 542.
Calambit, 249.
Calamus Barteri, 726.
—— deerratus, 727.
—— Rotang, 728.
—— scipionum, 728.
Calathea, 638.
—— Allouya, 669.
—— conferta, 669.
Calayate, 519.
Calebasse-terre, 330.
Calembe, 196.
Caletete, 582.
California Golden Sorghum, 797.
—— Wheat, 797.
Cali Nuts, 221.
Calisaya Bark, 349.
Callichilia Barteri, 444.
Calocanting, 210.
Calocarpum mammosum, 400.
Calomel, 464.
Calonyction muricatum, 473.
—— speciosum, 474, 637.
Calophyllum Calaba, 133.
Calotropis gigantea, 463.
—— procera, 455, 463.
Caltrops, Water, 325.
Calumbibit, 249.
Calutete, 579.
Camange, 527.
Camara, 516.
—— piquant, 516.
Camatis, 480.
Camba-camba, 617.
Cambing, 249.
Cambo, 286.
Camel Grass, 813.
—— Hay, 813.
Cameroon Mahogany, 418.
Camirium, 595.
Cammara, 516.
Camoxo-caiala, 207.
Campechy Wood, 255.
Camphor, 562.
—— Grass, 810.
—— Laurel, 562.
Campylochiton platypterus, 310.
Camwood, 240, 242, 246, 247, 795.
——, Black, 244.
——, Red, 241.
Canadian Citron, 336.
Caña fistula, 257.
Canapistola, 257.
Canarium edule, 141, 142.
—— Schweinfurthii, 142.
Canary Banana, 670.
Canavalia ensiformis, 221.
—— obtusifolia, 222.
Cancerilla, 464.
Candle Nut, 595.
Cane, China Sugar, 799.
——, Chinese, 804.
——, Elephants' Sugar, 342.
——, Honey, 798, 805.
——, Japanese, 780.
——, Java, 784.
——, Lahaina, 780, 784, 785.
——, North China Sugar, 799.
——, Ribbon, 779.
——, Sugar, 779.
——, Texas Seeded Ribbon, 798, 805.
——, Uba, 280, 283, 286.
Canhamo, 614.
Cannabinaceae, 614.
Cannabis sativa, 181, 183, 614.
Canna edulis, 670.
—— indica, 669.
Cantaloup, 334.
Cantar bark, 51.
Canthium Afzelianum, 359.
—— glabriflorum, 359.
—— lanciflorum, 359.
Canume-numi, 576.
Capayo, 328.
Cape Damson, 238.

Cape Gooseberry, 488.
—— Mahogany, 146.
—— Tweek Grass, 828.
Caperonia palustris, 597.
Capim de Angola, 833.
—— dos Caballos, 855.
—— de Colonia, 833.
—— gordura, 840.
—— mellado, 840.
—— de Rhodes, 857.
Capparidaceae, 54.
Capsicum, Annual, 490.
—— annuum, 489.
—— baccatum, 490.
——, Berry, 490.
—— frutescens, 490.
——, Shrubby, 490.
Capsicums, 491.
Capuchin Powder, 464.
Cara, 475.
Carabo, 824.
Caralluma Dalzielii, 466.
—— Decaisneana, 466.
Carap, 148.
Carapa guianensis, 148.
—— procera, 149.
—— oil, 150.
Cardamom, 663.
——, Lesser, 663.
——, Malabar, 663.
Cardiospermum Halicacabum, 165
Cardol Oil, 175.
Caretete, 582.
Cariaquillo, 516.
Carib Cabbage, 756.
Carica Papaya, 327.
Carissa edulis, 438
Carissa grandiflora, 438.
Carnauba Wax, 780.
Carob Bean, 262.
Carpet Grass, 823.
Carpodinus Barteri, 436.
—— dulcis, 436.
—— fulva, 437.
—— hirsuta, 433, 437.
—— umbellata, 440.
Carpolobia alba, 60.
—— lutea, 60.
Carrapicho, 68.
Carrizo, 847.
Carthamine Dye, 392.
Carthamus lanatus, 392.
—— tinctorius, 392.
——, Woolly, 392.
Casca Bark, 279.
Cascalate, 250.
Cascarilla Colorada, 350.
Cashaw, 285.
Cashew Apple, 175.
—— Nut, 175.
—— Spirit, 176.
Cassada, 601.
Cassava, 601.
——, Bitter, 601.
——, Sweet, 601.
Cassia Absus, 256.
—— acutifolia, 256.
—— alata, 257.
—— angustifolia, 256.
——, Farnesian, 292.
—— Fistula, 257.
——, Foetid, 260.
—— marilandica, 256.
—— mimosoides, 258.
—— obovata, 258.
—— occidentalis, 259.
——, Purging, 257.
—— Sieberiana, 260.
—— Sophera, 260.
—— Tora, 260.
Cassie, 292.
Casso, 596.
Cassoneira, 576.
Castilloa elastica, 635.
Castor Oil Plant, 608.
Casuanze, 506.
Casuarina equisetifolia, 650.
—— muricata, 650.
Casuarineae, 650.
Catechu, Pale, 347.
—— Palm, 712.
Catiang Bean, 229.
Catmint-leaved Leontis, 536.
Catyang Bean, 229.
Cavangerie, 784.
Cay-boi-boi, 472.
Cayennne pepper, 490.
Ceara Rubber, 598.
Cedar, 146.
——, Bastard, 145.
——, White, 133.
Cedre ou Filao, 650.
Ceiba Casearia, 87.
—— pentandra, 87.
Celastrineae, 160.
Celastrus senegalensis, 160.
Celosia argentea, 539.
—— cristata, 540.
—— trigyna, 540.
Celtis Durandii, 612.
—— integrifolia, 613.
—— Soyauxii, 613.
—— Zenkeri, 613.
Cenchrus catharticus, 846.
Centaurea Perrottetii, 391.
Central African Date, 138.
—— American Rubber, 636.
Cephaelis Ipecacuanha, 375.
Cephalandra indica, 337.
Cephalostachyum pergracile, 878.
Cerasee, 333.
Ceratonia Siliqua, 261.
Ceratotheca sesamoides, 513.
Cerbera, Linear leaved, 440.

Ceredi, 735.
Ceriops Candolleana, 304.
Ceylon Leadwort, 396.
Chacalxochitl, 251.
Chaetochloa italica, 837.
Chafflower, Prickly, 543.
Chakramarda, 260.
Chailletiaceae, 156.
Chailletia cymosa, 157.
—— toxicaria, 156.
Chain Cotton, 77.
Chamico Blanco, 493.
—— Morado, 494.
Chamisco, 494.
Changeable Rose Hibiscus, 73.
Changing Rose Mallow, 73.
Channel'd stalked Crotalaria, 181.
Chaputa, 273.
Charcoal Tree, 614.
Charrah, 330.
Chasegj, 760.
Chaste Tree, 525.
Chayote, 340.
Chebweri, 303.
Chedia, 632.
Chediya, 632
Chegt Mung, 227.
Chena, 835.
Chenchen, 639.
Chenedazugu, 593.
Chenga, 289.
Chenopodiaceae, 544.
Chenopodium ambrosioides, 544.
Cherimoyer, 47.
Cherry, Winter, 165.
Chestnut, Water, 324, 325.
Chewstick, 308.
Chicao, 289.
Chiches, 207.
Chick Pea, 207.
—— Stone Tree, 249.
Chicle, 401, 563.
Chickling Vetch, 208.
Chickm, 256.
Chictzapotl, 400.
Chida, 632.
Chi-Kiah-hwa, 322.
Chikwani, 298.
Chilian Grass, 850.
Chillies, 491.
—— of Commerce, 490.
Chilpati, 464.
Chima, 512.
Chimed, 256.
China Bean, 211.
—— Berry, 145.
—— Blackwood, 238.
—— Grass, 646.
—— —— Cloth Fibre, 646.
—— ——, Green-leaved, 647.
—— Potato, 756.
Chinchoncho, 236.
Chinese Banana, 670.
—— Burr, 106.
—— Cotton, 78.
—— Date, 161.
—— Guava, 316.
—— Jute, 68, 111.
—— Sorgo, 798.
Ching Tow, 211.
Chin pa tzu, 484.
Chinyenye, 248.
Chinyolombosi, 513.
Cherinda Medlar, 361.
Chiriri, 310.
Chirokko, 226.
Chita, 396.
Chitowe, 512.
Chitra, 396.
Chitta, 662.
—— Afu, 665.
Chiwo, 429.
Chixe, 90.
Chiyawar, 860.
Chloris Gayana, 826, 857.
—— pallida, 854.
—— robusta, 858.
—— virgata, 858.
Chlorophora excelsa, 521, 616.
Chocolate, 96, 805.
——, Gaboon, 137.
Chocho, 340.
Choko, 340.
Cholam, 806.
Chouchou, 340, 689.
Chow Chow, 340.
Chowlee, 229.
Chrallanta, 496.
Christmas Bush, 607.
—— Flower, 575.
Christophine, 340.
Chrysobalanus Icaco, 301.
Chrysophyllum africanum, 397
—— albidum, 397.
—— Cainito, 397.
—— Millenianum, 397.
—— Welwitschii, 398.
Chu, 358.
Chufani, 50.
Chufas, 761.
Chufu, 761.
Chuku, 340.
Chumlar-sag, 541.
Chuta, 463.
Chytranthus Mannii, 168.
Cicer arietinum, 207.
Cicrite, 354.
Cinamoms, 322.
Cinchona Calisaya, 349.
—— —— var. Ledgeriana, 349.
—— officinalis, 349.
—— succirubra, 350.
—— Febrifuge, 351.
Cinnamomum Camphora, 562.

Cinnamomum zeylanicum, 565.
Cinnamon, 565.
——, Black, 316.
——, Red, 316.
——, White, 316.
——, Wild, 316.
Circassian Seeds, 284.
Cissampelos Pareira, 52, 551.
—— —— var. owariensis, 52.
Cissus, 163, 164.
Citrate of Lime, 134.
Citron, 131.
——, Canadian, 336.
—— of the Sea, 157.
—— Smelling Bay, 316.
Citronella Grass, 810.
Citronelle, 810, 812.
Citrullus Colocynthis, 330.
—— vulgaris, 336.
Citrus aurantium, 122.
—— —— var. Bigaradia, 122.
—— decumana, 129.
—— Medica, 131.
—— —— var. acida, 131.
—— —— var. limonum, 135.
——, Giant, 129.
Cladosicyos edulis, 332.
Clavellina, 251.
Clematis, 47.
—— grandiflora, 47.
—— Thunbergii, 47.
Clerodendron Bucholzii, 523.
—— capitatum, 523.
—— Formicarum, 523.
—— fragrans, 523.
—— myricoides, 523.
—— polycephalum, 524.
—— scandens, 524.
—— sinuatum, 524.
—— splendens, 524.
—— Thomsonae, 524.
—— volubile, 524.
Climate, 10,
Climbing Hemp-weed, 382.
Clitandra cirrhosa, 435.
—— elastica, 435.
—— Henriquesiana, 432.
—— visciflua, 436.
Clitoria Ternatea, 210.
Clove, 319.
——, Wild, 316.
Clover, Horned, 186.
——, Japan, 824.
——, Uganda, 824.
Club Gourd, 330.
Cnestis corniculata, 178.
—— ferruginea, 179.
Coca, 117.
——, Huanuco, 117.
——, Java, 117.
——, Peruvian, 117.
——, Truxillo, 117.
Cocaine, 119.
Coccus lacca, 161.
Cochlospermum tinctorium, 57.
Cock's Comb, 472, 540.
Cocoa, 96, 301.
——, Criollo, 96, 99, 101.
——, Ecuador, 101.
——, Forastero, 96, 99, 101.
Coco grass, 766.
—— Plum, 301.
—— Plumb Tree, 301.
—— Yam, 695, 756.
Cocos nucifera, 744.
Cocculus Leaeba, 52.
Codio, 464.
Codoudou, 437.
Coffea arabica, 361.
—— —— var. leucocarpa, 363.
—— excelsa, 372.
—— Laurentii, 366.
—— liberica, 364.
—— robusta, 366.
—— stenophylla, 367.
Coffee, Arabian, 362.
——, Blue Mountain, 362.
——, Bush, 367.
——, Congo, 366.
——, Highland, 367.
——, Liberian, 364.
——, Maragogipe, 362.
——, Mocha, 362.
——, Negro, 259.
——, Rio Nunez, 366.
——, Robusta, 366.
——, Senna, 259.
——, Wild, 259, 355.
Coix Lacryma-Jobi, 774.
Coke Wood, 617.
Cola acuminata, 91, 607, 667.
—— anomala, 92.
—— Ballayi, 92.
—— cordifolia, 93.
—— Johnsonii, 92.
—— lepidota, 92.
—— vera, 91.
—— verticillata, 92.
Coleira, 91.
Coleus dysentericus, 531.
—— parviflorus, 531.
—— rotundifolius, 531.
—— rugosus, 531.
—— salagensis, 531.
—— tuberosus, 531.
Collection of Specimens, 18.
Collectors, 22.
Colocasia Antiquorum, 695, 755, 756.
Coloquintada bastarda, 329.
Coloquintida, 330.
Comb Fringe Grass, 861.
Combo, 558.
Combo-Combo, 641.

Combretaceae, 306.
Combretum bracteatum, 309.
—— glutinosum, 310.
—— Hartmannianum, 310.
—— leonense, 310.
—— micranthum, 310.
—— mucronatum, 311.
—— Raimbaultii, 311.
—— Zenkeri, 311.
Commelina nudiflora, 711.
Commiphora africanum, 140.
Common Basil, 527.
—— Indian Reed, 670.
—— Reed, 847.
Comorim, 490.
Compositae, 378.
Conakry Niggers, 430.
Concombre metulifere, 335.
Condeamor, 333.
Condol, 332.
Condor, 332.
Congo Bean, 236.
—— Coffee, 366.
—— gloncongo, 596.
—— -holz, 238.
—— Pea, 236.
—— Red Rubber, 430.
Connaraceae, 178.
Connarus africanus, 178.
Conocarpus erectus, 308.
—— racemosa, 309.
Conopharyngia crassa, 445.
—— durissima, 444.
—— Holstii, 445.
—— pachysiphon, 444.
—— stenosiphon, 445.
Convolvulaceae, 473.
Convolvulus, Azure, 480.
Copaiba or Copaivi, Balsam, 270.
Copaifera Guibourtiana, 277.
Copal, Accra, 272.
—— Tree, 269.
Copernicia cerifera, 780.
Coral Wood, 284.
Corchorus capsularis, 66, 67, 109, 183.
—— olitorius, 114.
—— tridens, 116.
Cordao do Frade, 536.
Cordia abyssinica, 469.
—— Irvingii, 470.
—— Milleni, 470.
—— Myxa, 470.
—— platythyrsa, 471.
—— Rothii, 471.
Cork Tree, 85.
—— Wood, 48, 75, 641.
Corn, 768.
——, Broom, 789.
——, Chocolate, 805.
——, Dari, 801.
——, Derry, 801.
Corn, Dry Season, 793.
——, Egyptian, 804.
——, —— Rice, 794.
——, Field, 770.
——, Guinea, 798, 801.
——, Indian, 768.
——, Jerusalem, 794.
——, Kafir, 792.
——, Mealie, 768.
—— Oil Cake, 769.
——, Pop, 770.
——, Rice, 804.
——, Sweet, 770.
Corynanthe paniculata, 352.
—— Yohimbe, 352.
Cosabeda, 338.
Cosa Standarani, 338.
Costus afer, 657.
—— lucanusianus, 430, 657.
—— speciosus, 658.
Cotton, Abassi, 79.
——, American Upland, 78.
——, Andes, 79.
——, Arabian, 77.
——, Ashmouni, 79.
——, Bahmiah or Bamia, 79.
——, Black-seeded, 80.
——, Black-seeded lowland, 80.
——, Chain, 77.
——, Chinese, 78.
——, Egyptian, 77, 79.
——, Gallini, 77.
——, Khaki, 78.
——, Kidney, 77, 80.
——, Levant, 77.
——, Maltese, 77.
——, Mitafifi, 79.
——, Nankin, 78.
——, Peruvian, 79.
——, Red Peruvian, 79.
——, S. American, 79.
——, American Short Staple, 78.
——, Siam, 78.
——, Syrian, 77.
——, Stone, 77.
——, Tree, 76, 77, 87.
——, Vine leaved, 80.
——, White Silk, 87.
——, Woolly-seeded Upland, 80.
——, Zafiri, 79.
Couch, 856.
Coula, 159.
—— edulis, 159.
Countess's Powder, 350.
Country Grapes, 163.
—— Mallow, 68.
—— Senna, 258.
—— Walnut, 595.
Courge Calebasse Etranglée, 330.
Couscous, 53, 55, 793.
Couzou, 326.
Cowhage, 220.

Cow-itch, 220.
Cow Pea, 99, 229, 800.
Crab Grass, 824, 825, 828.
—— Oil, 148.
—— Eyes, 209.
—— Tree, 148.
—— wood, 148.
Crataeva religiosa, 55.
Craterispermum laurinum, 361.
Craw-craw, 87.
—— medicine, 441.
Cream Fruit, 447.
—— of Tartar Tree, 85.
Creeper, Rangoon, 312.
Creeping Panic Grass, 856.
Cremaspora africana, 359.
Crescentia Cujete, 507.
Cresson des Indies, 389.
Cress, Para, 389.
Cresson-Para, 389.
Crêtecoq, 472.
Crête de Inde, 518.
Crin-Crin, 115.
Crinum giganteum, 681.
—— natans, 681.
—— pauciflorum, 681.
—— podophyllum, 681.
—— purpurascens, 681.
—— Sanderianum, 681.
—— Yuccaeflorum, 681.
Criollo Cocoa, 96, 99, 101.
Crossandra flava, 515.
—— guineensis, 515.
Crossopteryx Kotschyana, 352.
Crotalaria, Channel'd Stalked, 181.
—— falcata, 181.
—— glauca, 181.
—— juncea, 181.
—— retusa, 184.
—— Rushy-stalked, 181.
—— striata, 99, 185.
—— verrucosa, 185.
——, Warted, 185.
——, Wedge-leaved, 184.
——, Window-stalked, 181.
Croton amabilis, 591.
—— lobatus, 592.
—— Tiglium, 592, 655.
Crowfoot Grass, 861.
Crown Bark, 350.
Crow's Eyes, 467.
Ctenium elegans, 859.
Cuba Bean, 229.
—— Grass, 796.
Cubeba, 554.
—— officinalis, 553.
Cubebs, 554.
—— African, 554.
Cubum Pap, 487.
Cuca, 117.
Cucumber, 335.
——, African, 333.
Cucumber, One-seeded, 340.
Cucumis Figarei, 334.
—— Melo, 334.
—— —— var. agrestis, 334.
—— metuliferus, 335.
—— Prophetarum, 335.
—— sativus, 335.
Cucurbitaceae, 329.
Cucurbita maxima, 338.
—— moschata, 338.
—— Pepo, 338.
—— —— var. ovifera, 33.
Culen, 545.
Culmatamba, 359.
Cultivated Medick, 186.
Cumac, 554.
Cumboo, 844.
Cup, Mountain Sweet, 326.
Cumin, 322.
Cundeamor, 333.
Cupid's Flower, 474.
Curassavian Swallow-Wort, 464.
Curcas, 593.
Curcuma longa, 659.
Currency, 15.
Curry Powder, 491.
Cus-cus, 807.
Cuspira, 285.
Cussonia nigerica, 342.
Custard Apple, 48, 49.
Cut Thorn, 162.
Cyanothyrsus Ogea, 268, 269.
Cylicodiscus gabunensis, 283.
Cymbopogon citratus, 810.
—— diplandrum, 815.
—— giganteus, 811.
—— hirtus, 815.
—— Nardus, 812.
—— proximus, 813.
—— rufus, 814.
—— Ruprechtii, 814.
—— Schoenanthus, 813.
—— sennariensis, var. proximus, 813.
—— solutus, 815.
Cynodon Dactylon, 796, 807, 854.
—— plectostachyum, 855.
Cynometra Mannii, 278.
Cyperaceae, 760.
Cyperus alopecuroides, 760, 762, 763.
—— articulatus, 760.
—— auricomis, 761.
—— esculentus, 761.
—— exaltatus, 762.
—— —— var. dives, 762.
—— fertilis, 763.
—— Haspan, 763.
—— maculatus, 763.
—— Papyrus, 764, 775.
—— rotundus, 766.
Cyphomandra betacea, 488.

Cyrtosperma senegalense, 759.
Cytisus proliferus, 179.
—— —— var. palmensis, 180.
——, Silky, 180.

Dabakala, 425.
Dabino, 715.
Dabirite, 433.
Dabra, 207.
Dabri, 433.
Dactyloctenium aegyptiacum, 861.
—— glaucophyllum, 862.
Dadap, 215.
Dadawa, 776.
Dadmarden, 257.
Dafaddu, 881.
Dafara, 164.
Dagga, 614.
Dagussa, 859.
Dahomah, 283.
Dahumah, 283.
Dai, 358.
Daizu, 211.
Dakhar, 275.
Dakka, 614.
Dakudu, 230.
Dakwora, 293.
Dal, 341.
Dalbergia melanoxylon, 237, 427.
Daldinia concentrica, 881.
D'Aloes Bleu, 682.
Dalo, 310.
Dalondan, 519.
Damba, 810.
Dam-Pan, 507.
Damro, 844.
Damson, Cape, 238.
Dandana, 505.
Dandata, 775.
Daniellia caudata, 268.
—— Fosteri, 268.
—— oblonga, 268.
—— Ogea, 268.
—— Punchii, 269.
—— similis, 269.
—— sp., 270.
—— thurifera, 269, 270, 271.
Dankali, 475.
Danko Gawi, 630.
Darakht-i-Miswák, 427.
Darambuwa, 806.
Dari, 792.
Darumba or Darumbuwa, 820.
Darwaso, 73.
Dasheen, 756.
Dataniya, 775.
Date, Central African, 138
——, Chinese, 161.
——, Desert, 138.
——, Indian, 275.
—— Palm, 717.
Dattock, 277.
Datura, Black, 492.
—— fastuosa, 492.
—— —— var. alba, 492
—— Metel, 493.
—— Stramonium, 493.
Daturin, 494.
David's-bush, 494.
Dawa, 795.
Dawar dorina, 797.
—— kada, 797.
—— rafi, 797.
Dazo rabi, 531.
Debbi, 232.
Deccan Hemp, 70.
Deda, 297.
Dé-dé-bakin, 736.
Deers Vanilla, 300.
Dégbakou, 736.
Degbakoum, 736.
Degendig Indig, 190.
Dek Indig, 190.
Del, 645.
Deleb, 729.
Deleib, 729.
Dendo, 424.
Dendrocalamus Hamiltonii, 875.
—— strictus, 876.
Denji, 66.
Denya, 284.
Dé or Deti, 735.
Desert Date, 138.
Desmodium triflorum, 206.
Detarium senegalense, 277.
Detarr, 277.
Devil's Apple, 494.
—— Fig, 53.
—— Grass, 807, 855.
Deyi, 391.
Dhak, 222.
Dhal, 236.
Dhunchee Hemp, 197.
Diabetes bark, 176.
Diakoula, 608.
Dialambam, 237.
Dialium guineense, 261.
Diamba, 310.
Diambe, 614.
Diammi, 275.
Diané, 275.
Dibg, 471.
Dichrostachys nutans, 286.
Dicoma tomentosa, 395.
Dicotyledons, 47.
Dictyandra arborescens, 355.
Diecha, 449, 450, 458.
Digitaria acuminatissima, 818.
—— debilis, 818.
—— diagonalis, 821.
—— exilis, 818.
—— gayana, 819.
—— horizontalis, 820.

Digitaria Iburua, 820.
—— Lecardii, 821.
—— longiflora, 821.
—— uniglumis, 821.
—— —— var. major, 821.
Diguilliny, 512
Digumbé, 737.
Dika, 137.
—— Bread, 137.
—— Nut, 137.
Dilenge, 842.
Dilleniaceae, 47.
Dilombe, 735.
Diluia, 354.
Dilula, 354.
Dilula-Riula, 354.
Dinhungo, 330.
Dinya, 525.
Diorgud, 48.
Dioscorea alata, 689, 694.
—— bulbifera, 690, 694.
—— cayenensis, 691.
—— dumetorum, 692.
—— prehensilis, 691.
—— rotundata, 693.
—— sativa, 690, 694.
Dioscoreaceae, 689.
Diospyros atropurpurea, 423.
—— crassiflora, 424.
—— Dendo, 424.
—— mespiliformis, 425, 521.
—— mombuttensis, 426.
Diospyros sp., 426.
Diou, 345.
Di-Ouaka-Ouaka, 737.
Dipobe, 735.
Dipterocarpus aromaticus, 519.
—— tuberculatus, 519.
Dish Cloth Gourd, 331.
Disombé or Disombo, 736.
Dissotis grandiflora, 321.
—— Irvingiana, 321.
—— segregata, 321.
Disue, 484.
Dita, 277.
Ditanga-Sese, 329.
Ditch Millet, 827.
Ditondo, 630.
Ditumbate, 538.
Dituti, 429.
Divi-Divi, 250.
Diwa, 775.
Diwakkawakka, 737.
Djarak, 593.
D'Jave, 418.
Djè-djè, 735.
Djendjeng, 321.
Djenge Vine, 432.
Djenje, 431.
D'kar, 275.
Dob, 634.
Dobisowo, 582.
Dobole, 248.
Doctor's Gum, 62.
Dodo, 325, 444, 445.
—— Cloth, 445.
Dog-buttons, 467.
Doggali-kura, 541.
Dog's Tooth Grass, 855.
Dohi, 231.
Doi or Doy, 231, 343.
Dojo, 862.
Dojvie, 554.
Doka, 267.
Dokan rafi, 266.
Dokhn, 859.
Dolichandrone platycalyx, 509.
Dolichos biflorus, 234.
—— Lablab, 234.
Dolique Mongette, 229.
Domashi, 380.
Domashin maza, 487.
Dombeya Buettneri, 95.
Dom or Doum Palm, 733.
Don, 430.
Donax cuspidata, 664.
Doob Grass, 855.
Doomwi, 711.
Doorwa, 856.
Doré, 260.
Doroa, 281.
Dorowa, 281.
Dou, 617.
Doumori butter, 423.
Doundaké, 343.
Doura, 281.
Dowda, 395.
Downy Thorn Apple, 493.
Doya, 690, 691.
Doyan bissa, 691.
Doyar bisa, 691.
Dracaena cylindrica, 702.
—— elegans, 702.
—— fragrans, 704.
—— Godseffiana, 702.
—— Goldieana, 702.
—— Mannii, 703.
—— phrynioides, 703.
—— surculosa, 703.
Druggists' Bark, 351.
Druosia laxiflora, 248.
Dry Season Corn, 793.
Duaday, 600.
Dub, 855.
Dubh, 855.
Dubin or Dubini, 153.
Duckweed, Greater, 759.
——, Lesser, 759.
Duffin Bean, 225.
Dugr, 229.
Dukhu, 844.
Dukki, 613.
Dumce, 607.
Dumori, 422.

Dumoria Heckelii, 419, 422.
Dum Palm, 733.
Dumya, 525.
Dunchi, 270.
Dundake, 343.
Dundu, 286.
Dunki, 613.
Duranta Plumieri, 518.
Durra, 792, 794, 804.
— eweige, 793.
— Negro, 798.
Durrah, 793.
Durumi, 631.
Durwi, 724.
Dussa, 295.
Dutbi, 729.
Duza, 838.
Dwarf Banana, 670.
—— Coconut, 744.
—— Ironwood, 139.
Dwatana, 775.
Dye, Carthamine, 392.
Dzinjerigya, 177.

Earth Almond, 761.
—— Nut, 201.
Easter Flower, 575.
East Indian Hemp, 181.
—— —— Senna, 256.
—— —— Tobacco, 496.
—— —— Walnut, 299.
Eba Edi, 693.
Ebanka, 166.
Ebe, 280.
Ebenaceae, 423.
Eben or Eban, 142.
Ebène du Sénégal, 238.
Ebenus, 237.
Ebesalebo, 670.
Ebo, 429.
Ebolo, 390.
Ebondo, 279.
Ebony, 238, 424, 425, 521.
——, Black, 424.
——, Calabar, 424, 425.
——, Egyptian Sensitive, 299.
——, Gaboon, 424.
——, Lagos, 424.
——, Mozambique, 237, 238, 427.
——, Oriental, 299.
——, Senaar, 238.
——, Senegal, 238.
——, Sierra Leone, 238.
—— Tree, 238.
——, Unyoro, 238.
—— Wood, 238.
——, Zanzibar, 425.
Ebo paste rubber, 434.
Ebu, 443.
Ebyjanjaro, 227.
Ecekou, 614.
Echeché, 308.
Echi, 244.
Echinochloa colona, 830.
—— Crus-Favonis, 830.
—— pyramidalis, 830.
—— stagnina, 831.
Eclipta alba, 384.
Ecose, 336.
Ecuador Cocoa, 101.
Eddoes, 756.
Ede, 291, 527, 735.
Edi, 525, 526.
Edible Hibiscus, 71.
—— Stemmed Vine, 164.
Edie, 359.
Education, 13.
Eduege, 735.
Efa, 766.
Ef-a-Kar, 641.
Effehn, 338.
Efia Ekpo Oyop, 735.
Efiako Eyop, 735.
Efiam, 693, 694.
Efinrin Maragbosanyan, 528.
Efirin, 529.
—— nla, 528.
—— Oshu, 528.
—— wewe, 527.
Efo, 260, 541.
—— Ebure, 390.
Efrie, 63.
Efunmundone, 453.
Efuru, 691, 696.
Efurumunda, 453.
Ega, 659.
Egamo-sena, 289.
Egansela Umqwembe, 275.
Egba, 304.
Egbesi, 343.
Ege, 595.
Egga Gutta, 577.
Egg, Garden, 483.
Eggo, 152.
Egg Plant, 483.
—— Plum, 161.
Eggun, 87.
Egira, 579.
Egpa, 201.
Egusi Bara, 336.
Egusu, 336.
Egwa, 524.
Egwarere, 711.
Egyptian Bindweed, 480.
—— Corn, 794.
—— Cotton, 77, 79.
—— Henbane, 493.
—— Kweek Grass, 861.
—— Mimosa, 289.
—— Myrobalans, 138.
—— Pea, 207.
—— Privet, 322.

Egyptian Rice, 797.
—— Rice Corn, 794.
—— Sensitive Ebony, 299.
—— Thorn, 289.
—— Wheat, 797.
Ehien, 554.
Ehin olobe, 583.
Ehyedua, 269.
Einches, 761.
Eirawi, 512.
Ejirin, 333.
Ejow Palm, 713.
Ekan, 777.
Eke-Oyibo, 145.
Eke-Oyinbo, 145.
Ekhimi, 283.
Eki or Ekki, 139.
Ekkehobi, 721.
Ekong, 778.
Ekoro, 179.
Ekoum, 596.
Ekpa, 201.
Ekpagoy or Ekpogoi, 266.
Ekpa-ro-ro, 232.
Ekpgoi, 266.
Ekpiro, 399.
Ekpogaije, 266.
Ekpogoze, 273.
Ekpuro, 399.
Ekuana, 280.
Ekububa, 738.
Eku gogoro, 513.
Ekusawa, 343.
Ekuya, 54.
Elaeis guineensis, 94, 98, 137, 413 655, 734.
—— —— var. albescens, 735.
—— —— —— angulosa, 735.
—— —— —— Ceredia, 735.
—— —— —— communis, 735.
—— —— —— —— f. dura, 735.
—— —— —— —— f. fatua, 736.
—— —— —— —— f. leucocarpa, 736.
—— —— —— —— f. semidura, 736.
—— —— —— —— f. tenera, 736.
—— —— —— gracilinux, 736.
—— —— —— idolatrica, 737.
—— —— —— macrocarya, 737.
—— —— —— Poissonii, 737.
—— —— —— rostrata, 738.
Elastic Resin Tree, 585.
Elatari, 663.
Elcaja, 146.
Elegbe Aju, 379.
Elemi, African, 142.
——, Manila, 143.
Elephant's foot, 381.
Elephant Grass, 797, 842.
Elephantopus scaber, 381.
Elephants sugar cane, 342.
Elettaria Cardamomum, 663.
Eleusine aegyptiaca, 861.
—— coracana, 859.
—— indica, 859.
Eleven-leaved Guinea Indigo, 191.
El-ghar, 525.
Elks' Horn Fern, 881.
Elondo, 279.
Elozy-Zégué, 157.
Elu, 244.
Elube, 836.
Eluku, 517.
Elwi, 617.
Emarr, 453.
Embate, 537.
Embi-Siembi, 441.
Emi, 410
Emido, 421.
Emien, 443.
Emigidi, 410.
Emi-ile, 573.
Emile, 573, 574.
Emilia sagittata, 390.
—— sonchifolia, 391.
Emi-Ori, 410.
Enantia polycarpa, 51.
Enasal, 663.
Ende, 304.
Endogo, 137.
Endottaral, 549.
Endun, 352.
Engessang, 590.
English Wire Grass, 828.
Eng Teak, 519.
Ensal, 663.
Ensale, 283.
Entada scandens 282.
—— sudanica 282.
Entandrophragma Candollei, 151.
Enterolobium Saman, 300.
Entire-leaved Bread Fruit, 644.
Entuge, 558.
Entupu, 821.
Epa, 201.
Epa orubu, 232.
Epepe, 308.
Epin or Epindo, 618.
Eragrostis abyssinica, 851.
—— biformis, 853.
—— ciliaris, 853.
—— gangetica, 853.
—— Major, 853.
—— megastachya, 853.
—— tremula, 854.
Eran, 820.
—— awo, 853.
—— Eye, 839.
Erapata, 584.
Erdnuss, 201.
Ere, 229, 453.
Erg-el-asda, 543.
Erghesana, 508.

Erig Agrab, 552.
Eriko, 724.
Erimado or Erinmado, 590.
Erin, 440.
Eriodendron anfractuosum, 87, 556, 655.
—— —— var. indicum, 87.
—— orientale, 87.
Eri Silkworm, 161.
Erogbo, 726.
Erva poubinha, 583.
Eru, 50, 281, 592.
Erugbo, 726.
Eruiju, 49.
Erun, 279.
Eruwa funfun, 809.
Eruwaw, 375.
Eruwo, 375.
Erythrina, indica, 214.
—— lithosperma, 98, 99, 215, 556.
—— senegalensis, 215.
—— suberifera, 216.
—— tomentosa, 470.
—— umbrosa, 98, 216.
Erythrophloeum guineense, 278, 521
—— micranthum, 279.
Erythroxylon Coca, 116.
—— —— var. Spruceana, 117.
—— novogranatense, 117.
—— truxillense, 117.
Esalebo, 670.
Esanigbakehe, 215.
Escabon, 180.
Escaldameo, 658.
Eschalot, 705.
Eschimno, 301.
Escoba, 66.
Ese-Kana-Kana, 860.
Esere, 224.
Eserine, 224.
Esho, 91.
Esifafine, 328.
Esinagbonom, 646.
Esinminrin, 691.
Esise, 179.
Esisi, 220.
Esita, 711.
Esitarne, 328.
Eso, 86, 91.
Essang, 590.
Esschenhout, 146.
Essfar, 392.
Estramonio, 492, 494.
Esu, 841.
Esun, 842.
Esun funfun, 842.
Esu-pupa, 842.
Esura, 106, 693.
Eté, 453.
Eteku, 165.
Etinyon, 115.
—— Mbkara, 61.
Etiponla or Etikponla, 538.
Etua, 511.
Eucalyptus, 312.
——, Lemon-scented, 313.
Euchlaena luxurians, 767.
—— mexicana, 767.
Eugenia caryophyllata, 318.
—— Jambos, 319, 369.
—— malaccensis, 320.
—— owariensis, 320.
Euphorbiaceae, 572.
Euphorbia aegyptiaca, 572.
—— arborescens, 578.
—— Barteri, 572.
—— Candelabrum, 572.
—— convolvuloides, 573.
—— hirta, 573.
—— lateriflora, 573.
—— media, 573.
—— pilulifera, 573.
—— Poissoni, 574.
—— prostrata, 574.
—— pulcherrima, 574.
—— rhipsaloides, 576.
—— scoparia, 576.
—— scordifolia, 575.
—— sepium, 575.
—— Tirucalli, 575.
—— unispina, 578.
Euterpe oleracea, 376.
Evergreen Millet, 796.
Evolvulus alsinoides, 473.
Ewa-dudu, 229.
Ewanmermi, 702.
Ewaruda, 378.
Ewa Taba, 497.
Eweaje or Ewa-aje, 711.
Ewe Aje, 543.
—— Aran, 469.
Ewedu, 115.
Ewe Egbesi, 343.
Ewe jedijedi, 379.
—— Ofo, 95.
—— Osun-Pupa, 241.
—— Owo, 543.
Ewon, 283, 290.
—— Adele, 516.
—— -agogo, 516.
Ewouagogo, 516.
Ewuro, 379.
Ewuro Odo, 378.
Ewuru-esi, 691.
Ewuruwura, 774.
Exile Oil, 440.
—— tree, 440.
Eya, 410.
Eye-pity, 754.
Eyes, Crow's, 467.
Eyo, 115, 279.
Eyo-Ganbi, 115.

Fa, 248.
Fa-Birama, 531.
Fadé, 737.
Fafetone, 463.
Fafton, 463.
Fagopyrum esculentum, 550.
Fagus. 334.
Fai, 280.
Faire, 280.
Falli, 294.
False Angostura Bark, 467.
—— Guinea Grass, 796.
—— Hemp, 181.
—— Kola, 63.
—— Pareira Brava, 52.
Fantsa, 381.
Fantupa Seed, 260.
Fara-fara, 802, 803.
Faraoro, 795.
Farin alayafu, 540.
Farin-doka, 267.
Faringi, 277.
Farnesian Cassia, 292.
Fasua, 62.
Fataque Grass, 834.
Fat Pork Tree, 301.
Fau, 75.
Faurea saligna, 569.
Fedigosa, 259.
Fedigoso, 259.
Fedogose, 259.
Fegimanra africana, 137.
Feigão, 229.
Feijão espadinho, 225.
Female Funtum, 453.
Fens, 848.
Ferin-doka, 267.
Fern, Adders Tongue, 881.
——, Elk's Horn, 881.
—— Male, 881.
Feru, 57.
Fesi-fesi, 776.
Feterita, 792, 798.
Fetfettis, 517.
Fever-bush, 529.
—— Nut, 249.
—— plant, Sierra Leone, 529.
Fibre, Buaze, 59.
Ficoideae. 341.
Ficus Anomani, 618.
—— asperifolia, 618.
—— Barteri, 619.
—— Brassii, 625.
—— capensis, 619.
—— capreaefolia, 620.
—— Carica, 620.
—— discifera, 622.
—— dryepondtiana, 622.
—— elastica, 623, 637.
—— elegans, 625.
—— eriobotryoides, 625.
—— —— var. Caillei, 626.
Ficus exasperata, 626.
—— glumosa, 627.
—— —— var. glaberrima, 627
—— gnaphalocarpa, 627.
—— ingens, 628.
—— iteophylla, 628.
—— katagumica, 628.
—— kawuri, 628.
—— Leprieuri, 628.
—— lyrata, 628.
—— Mucoso, 629.
—— natalensis, 629.
—— Neumanni, 625.
—— ovata, 630.
—— platyphylla, 630.
—— polita, 631.
—— populifolia, 631.
—— Thonningii, 632.
—— trachyphylla, 627.
—— umbellata, 632.
—— Vallis-Choudae, 633.
—— verruculosa, 633.
—— Vogeliana, 633.
—— Vogelii, 634.
Fidasarse, 574.
Fida Sartsi, 574.
Fidda Saruta, 574.
Fiddeli, 256.
Fidele, 256.
Fiditi, 244.
Fidroh, 408.
Field Corn, 770.
—— Pea, 218.
Fig, 620.
——, African, 343.
——, Devil's, 53.
——, India-rubber, 623.
——, Smyrna, 620.
Fijian Almond, 306.
Fiji Arrowroot, 688.
Filao Wood, 650.
Filasko, 258.
Filbert, West Indian, 282.
Filices, 880.
Finger Grass, 818.
Fingo gifingo, 209.
Fingrigo, 539.
Finibi, 664.
Fiofio, 236.
Fique, 686.
Fire Foré, 524.
Fire-weed, 494.
Firmiana Barteri, 91.
Fistula, Caña, 257.
——, Purging, 257.
Fitangosana, 390.
Fitta, 664.
Flacourtia flavescens, 59.
—— Ramontchi, 59.
Flake Rubber, 437, 630.
Flamboyante, 253.
Flame Tree, 253.

Flatcrown, 298.
Flax, 66.
Fle, 581.
Flea-bane, Ash-coloured, 379.
Flor de Cameron, 251.
Flor de Muerto, 523.
Florence Whisk, 789.
Flores de Pascua, 575.
Florida Velvet Bean, 218.
Flower, Cupid's, 474.
——, Moon, 474.
——, Nepal Trumpet, 451.
——, Paradise, 251.
——, Peacock, 251.
——, Purple-fruited Passion, 326.
——, Shoe, 73.
——, Square-Stemmed Passion, 327.
——, Stinking Passion, 326.
Fluggea microcarpa, 584.
Foetid Cassia, 260.
Fofo, 346.
Fofui or Fofoi, 640.
Folé grandi, 433.
Folia Sennae, 256.
Fomes lucidus, 881.
Fonio, 818.
Foosca, 57.
Forastero Cocoa, 96, 99, 101.
Forbidden Fruit, 129.
Foré, 430, 512.
Foreign Bean, 201.
Forest Grapes, 165.
—— Oak, 650.
—— Reserve, 40.
—— ——, Alabetta River, 42.
—— ——, Benin, 42.
—— ——, Guara River, 46.
—— ——, Ibadan, 40.
—— ——, Ilaro, 41.
—— ——, Lokoja, 46.
—— ——, Mamu, 40.
—— ——, Oloki-Meji, 40.
—— ——, Oshun River, 40.
Forestry, 39.
Fotsivony, 382.
Fouftan, 463.
Four o'clock plant, 537.
Fourou, 597.
Four-winged bean, 234.
Fousente-farate, 215.
Foxtail Millet, 837.
Fra-Fra Potato, 531.
Franchipanier, 442.
Frangipanni, 442.
Frankincense of Sierra Leone, 270.
Fraoba, 281.
French Bean, 227.
—— Honeysuckle, 198.
Frijolillo, 259.
Fromager, 87.
Froumodon, 452.
Fructo do Condo, 47.
Fruit, Cream, 447.
——, Grape, 129.
Fuemomi, 523.
Fugindi, 258.
Fugi, 282.
Fül Sennari, 201.
Fumaria parviflora, 516.
Fumastra, 494.
Fundengi, 818.
Fundi, 818, 820.
Fundingi, 818.
Funfure, 821.
Fungi, 881.
Fungo, 630.
Funtum, 452, 453.
——, Female, 453.
——, Male, 452.
Funtumia africana, 451.
—— elastica, 263, 405, 437, 443, 453, 457, 521, 588.
Fura, 841.
Furcraea gigantea, 686, 701.
Fure, 378.
Furin gaddu, 474.
Furuduga, 268.
Furudugu, 178.
Fuse, 282.

Gaango, 300.
Gabara, 833, 847.
Gabna, 715.
Gaboon Chocolate, 137.
Gadakuka or Gadau-kuka, 551.
Gadeau, 153.
Gadiggi, 207.
Gadze, 282.
Gagayah, 345.
Gajiri, 815.
Galba, 133.
Galbiji, 525.
Gallini Cotton, 77.
Gallito, 251.
Gamafada, 260.
Gamba, 809.
Gambari Farm, 591.
Gambian Kino, 239.
Gambia, Mahogany, 155.
—— Pods, 289.
—— Rosewood, 239.
—— Tea, 517.
Gambier, 347.
Gambir, 347.
Gamji, 630.
Gamopetalae, 343.
Gandul, 236.
Ganga, 614.
Gangaman, 659.
Gangammo, 659.
Gangamu, 659.
Ganji, 630.
Ganna, 875.

Gara. 139, 244.
Garad, 289.
Garafini, 333.
Garandak, 293.
Garasa, 849.
Garavance, 207.
Garawao, 805.
Garawi, 800.
Garcinia kola, 63.
—— Mangostana, 64.
—— ovalifolia, 65.
Garden Calalu, 542.
—— Egg, 483.
—— Pea, 209.
Gardenia Jovis-tonantis, 358.
—— lutea, 358.
—— octomera, 357.
—— ternifolia, 357.
—— viscidissima, 358.
—— Vogelii, 358.
Garesu, 422.
Garigari, 527.
Garlic, 471, 708.
Gartoom, 392.
Gasse, 619.
Gasso, 596.
Gatarin Kureje, 710.
Gauden Kura, 357.
Gauta Kara, 483.
Gautan Kura, 483.
Gawasa, 303.
Gawo, 288.
Gawosge, 788.
Gaye, 282.
Gayi, 282.
Gbaguen, 768.
Gbanjakola, 91.
Gbegi, 860.
Gbeido, 51.
Gbingbin, 240.
Gbingbindo, 240.
Gbodogi, 667.
Gboi-boi, 453.
Gboli, 768.
Gbomi, 446.
Gboyingboyin, 179.
Geda, 201.
Gedda, 201.
Gesse, 208.
Gemeise, 627.
Gemüse Corchorus, 115.
Genet Epineux, 253.
Gera, 244.
Geraniaceae, 121.
Gerbaad, 552.
Gergelim, 512.
Gero, 803, 843, 844.
Geron Tsuntsaye, 583.
Gete, 795.
Getah Rambong, 623.
Geybido, 51.
Ghaneri, 516.
Ghati-Pit-Papra, 516.
Ghelambann, 238.
Ghorla, 850.
Giant Bermuda Grass, 856.
—— Citrus, 129.
—— Lily, 686.
Gibbein, 483.
Gigantic Grevillea, 570.
—— Swallow Wort, 463.
Gigeya, 345.
Giginia, 729.
Giginiar biri, 688.
Ginger, 665.
—— -bread Palm, 733.
—— -bread plum, 303.
—— -Millet, 859.
Gingili, 512.
Gipepe de Songa, 51.
Giragiri, 766.
Gisekia pharnacioides, 341.
Giwini, 445.
Gizazama, 776.
Gizgiri, 761.
Gladiolus multiflorus, 679.
—— quartinianus, 679.
—— spicatus, 680.
—— zambesiacus, 680.
Gliricidia maculata, 98, 197.
Gloriosa superba, 709.
—— virescens, 710.
Glycine hispida, 211.
—— Soja, 211, 471, 800.
Glyphaea grewioides, 116.
Glyphodes ocellata, 456.
Gnar Nuts, 325.
Gnienie, 321.
Gnooshway, 257.
Goa Bean, 234.
Goâne, 298.
Gobbo, 71.
Gobi, 148.
Godawgbaw-Odo, 712.
Gofe or Goffe, 641.
Gogo, 282.
Gogomasu, 378.
Gold Coast Gum Copal, 269.
—— —— Lump Rubber, 454.
Golden Crown Grass, 825.
—— Shower, 257.
—— Thistle of Peru, 53
Gold Mohur, 253.
Golpatta, 715.
Golphal, 715.
Goma, 512.
Gombé, 449.
Gomme de Sennaar, 295.
—— —— Souakim, 293.
—— du bas du fleuve, 293.
—— —— haut du fleuve, 293.
—— —— Senegal, 293.
—— Salabreda, 288.
—— Sennari, 295.

Gomme Talha, 293.
Gommier blanc, 290.
Gomphrena globosa, 544.
Gomuti Palm, 713.
Gondi, 471.
Gongalasu, 85.
Gongo, 631, 632.
Gongoresi, 356.
Gongoun-Kiur, 441.
Gongwe, 631, 632.
Gongwi, 634.
Gonja, 91.
—— Kola, 94.
Goober Nut, 201.
Goonah, 336.
Gooseberry, Cape, 488.
Goose Grass, 861.
Gora, 330, 875.
Gorakmundi, 384.
Gor-giyah, 813.
Goriba, 732.
Gorrko, 497.
Gorwi, 641.
Gossypium africana var. Wightiana, 79.
—— arboreum, 76.
—— —— var. neglecta, 76.
—— —— var. sanguinea, 76.
—— barbadense, 76.
—— —— var. maritima, 77.
—— brasiliense, 77.
—— herbaceum, 77.
—— hirsutum, 77.
—— mexicanum, 78.
—— Nanking, 78.
—— —— var. Bani, 78.
—— —— —— Nadam, 78.
—— —— —— Roji, 78.
—— —— —— soudanensis, 78.
—— obtusifolium, 78.
—— —— var. africanum, 78.
—— peruvianum, 79.
—— punctatum, 79.
—— —— var. Nigeria, 79.
—— vitifolium, 79.
Gotte Kelin, 531.
——, Kelingan, 531.
Gouengbe, 490.
Gourd, Bonnet, 331.
——, Bottle, 330.
——, Calabash, 330, 338.
——, Club, 330.
——, Dish Cloth, 331.
——, Mush, 338.
——, Naples, 338.
——, Portmanteau, 338.
——, Siphon, 330.
——, Sour, 85.
——, Squash, 338.
——, Towel, 331.
——, Wax, 332.
——, White, 332.
Gouro, 510.
Gouroundou, 531.
Governor Mango, 170.
Goyongbakai, 282.
Grabra, 379.
Graine de Moluques, 592.
—— —— Tilly, 592.
Graines-tiques, 249.
Grains d'ambrette, 69.
Grain, Black, 256.
Grains of Paradise, 661, 662.
Gram, Bengal, 207.
——, Black, 207.
——, Green, 227.
——, Horse, 207, 234.
——, Mozambique, 201.
——, White, 211.
Gramineae, 767.
Granadilla, 327.
Grand Haricot du Perou, 593.
—— pois pouilleux, 221.
Grangea maderaspatana, 383.
Grapes, Country, 163.
——, Forest, 165.
Grape Fruit, 129.
Grass, Alang Alang, 777.
——, Aleppo, 796.
——, Bahama, 855.
——, Bareet, 869.
——, Bengal, 834.
——, Bermuda, 796, 822, 823, 824, 825, 829, 855, 856.
——, Bitter, 824.
——, Blady, 777.
——, Brazilian Stink, 840.
——, Buffel, 838.
——, Buffalo, 767, 822, 828.
——, Bulrush, 842.
——, Bunch Spear, 816.
——, Camel, 813.
——, Camphor, 810.
——, Cape Tweek, 828.
——, Carpet, 823.
——, Chilian, 850.
——, Citronella, 810, 812.
——, Coco, 766.
——, Comb Fringe, 861.
——, Crab, 824, 825, 828.
——, Creeping Panic, 856.
——, Crowfoot, 861.
——, Cuba, 796.
——, Devil's, 807, 855.
——, Dog's Tooth, 855.
——, Doob, 855.
——, Dubh, 855.
——, Egyptian Kweek, 861.
——, Elephant, 797, 842.
——, English Wire, 828.
——, False Guinea, 796.
——, Fataque, 834.
——, Finger, 818.
——, Giant Bermuda, 856.

Grass, Golden Crown, 825.
——, Goose, 861.
——, Green, 824.
——, Guinea, 823, 834.
——, Hilo, 824, 825.
——, Honey, 840.
——, Hungarian, 837.
——, Indian Couch, 855.
——, Johnson, 796.
——, Kangaroo, 817.
——, Kikuyu, 840.
——, Kweek, 861.
——, Lalang, 777, 778.
——, Lanzura, 795.
——, Large Water, 825.
——, Leichardt, 825.
——, Lemon, 810, 812.
——, Louisiana, 823.
——, Mat, 828.
——, Mauritius, 822.
——, Means, 796.
——, Mission, 828.
——, Molasses, 840.
——, Napiers' Fodder, 842.
——, Natal, 839.
——, —— Kweek, 861.
——, —— Tweek, 828.
——, Nut, 766.
——, Orange, 810.
——, Para, 781, 822, 834.
——, Paramatta, 850.
——, Paspalum, 825, 826.
——, Perfume, 810.
——, Pimento, 828.
——, Prickly Bur, 846.
——, Rapoko, 861.
——, Rat-tail, 850.
——, Rhodes, 826, 857.
——, Rooi, 817, 818.
——, St. Augustine, 828.
——, St. Lucie, 856.
——, Scotch, 822.
——, Sour, 808, 809, 824.
——, Spear, 777, 816, 817.
——, Star, 855.
——, Stink, 853.
——, Sudan, 800.
——, Sweet, 807, 858.
——, Syrian, 796.
——, Tambookie, 814, 817.
——, Teff, 851.
——, Tunis, 800.
——, Tussock, 850.
——, Tweek, 828.
——, Uganda, 855.
——, Wild Ass, 813.
——, —— Rapoko, 861.
——, Wire, 828, 849, 855.
——, Worm, 469.
——, Yard, 861.
——, Zoet, 858.
Gray-skinned Plum, 302.
Greater Duckweed, 759.
—— Yam, 690.
Great Millet, 801.
Green Amaranth, 540.
—— Calalu, 542.
—— Gram, 227.
—— Grass, 824.
Greenheart, 416.
——, African, 284.
Green-leaved China Grass, 647.
Grenadilha, 237.
Grevillea robusta, 570.
Grewia bicolor, 105.
—— mollis, 106.
—— salvifolia, 105.
Grigri, 527.
Ground Nut, 201.
Grumilea psychotrioides, 378.
Guacalote Prieto, 249.
Guaco, 382.
Guamgua, 260.
Guamo Rabo di Mico, 368.
Guango, 98.
Guarea Thompsonii, 146.
Guava, 315.
——, Apple, 315.
——, Chinese, 316.
——, Monkey, 425.
——, Pear, 315.
——, Purple fruited, 316.
Guaxima, 68.
Guayaquil Thorn Apple, 493.
Gub-a-Gubs, 232.
Guchia, 201.
Guda, 705.
Gudagi, 705.
Gude gude, 861.
Gudumar Zomo, 710.
Gueenguezo, 235.
Guenoudeck, 160.
Guibili, 496.
Guigo, 375.
Guiguis, 263.
Guilandina Seeds, 249.
Guimbi, 146.
Guinea Grass, 823, 834.
—— Pepper, 490.
Guiquisa, 263.
Gujia, 232.
Gul A'bbas, 537.
Gulmohr tree, 253.
Gum Arabic, 91, 289, 293, 295, 296.
——, Babool, 289.
——, Blue, 313.
——, Butea, 222.
——, Chicle, 400.
——, Chicle tree, 400.
—— Copal, 269.
—— Copal, Gold Coast, 269.
——, Doctor's, 62.
——, Hog, 62.
——, Kordofan, 293.

Gum, Mumuye, 310, 311.
——, Sapodilla, 400.
——, Senegal, 293.
——, Suakim, 295.
——, Talca, 295, 296.
——, Talh, 295.
——, Talha, 295, 296.
——, Turkey, 293.
Gumbo, 71.
Gumdingula, 468.
Gumwi, 281.
Gundi, 471.
Gunga, 614.
Gurahorgwe, 569.
Guran, 425.
Gurijia, 86.
Gurji, 334.
Gutta, Egga, 577.
——, Niger, 630.
—— Percha, 397, 403, 405, 637.
——, Potato, 577.
—— Shea, 410.
—— Taban, 403.
Guttiferae, 62.
Gwanda, 327.
Gwangwala, 724.
Gwaza, 388, 756.
Gwodeyi, 160.
Gyazama, 776.
Gymnema sylvestre, 465.
Gymnosporia senegalensis, 160.
—— —— var. inermis, 160.
Gynandropsis pentaphylla, 54.
Gynura cernua, 390.

Haemanthus cinnabarinus, 680.
—— multiflorus, 680.
—— rotularis, 680.
—— rupestris, 680.
Haemarthria fasciculata, 776.
Haematostaphis Barteri, 177.
Haematoxylon campechianum, 253.
Haemorrhage plant, 385.
Hagaso, 397.
Hairy Flowered Paspalum, 825.
—— Panick Grass, 855.
Haisache, 292.
Hakorin Kare, 829.
—— machiji, 543.
Haldi, 659.
Hamaize, 794.
Hameid, 334.
Hanan Kuturu, 342.
Hanitrinimpantsaka, 382.
Hannoa undulata, 136.
Hanu, 526.
Hararabi, 526.
Haraz, 288.
Hard Shell Palm Nut, 735.
Harfo, 853.
Harhass, 293.
Haricot Bean, 227.
——, Burma, 234.
—— du Perou, 593.
Harikia, 818.
Harkiya, 818.
Haronga madagascariensis, 62.
Harras, 288.
Harub, 263.
Haschab, 293.
Haschisch, 614.
Hashab, 293.
Hasheesh, 614.
Hasihraf, 626.
Hassa Kala, 799.
Hassan Jack Fruit, 645.
Hau, 75.
Hausa Potato, 531.
Havana Tobacco, 498.
Hawaiian Red-top, 839.
Hazu, 592.
Head, Red, 464.
Heart Pea, 165.
—— Seed, 165.
Hedionda, 259.
Hediondo, Jasmin, 523.
Hedychium coronarium, 658.
Hedysarum coronarium, 198.
Heglik, 138.
Heglisk, 138.
Helianthi, 388.
Helianthus annuus, 385.
—— decapetalus, 388.
—— macrophyllus, 388.
—— tuberosus, 387.
Heliotrope, Indian, 472.
Heliotropium indicum, 472.
—— undulatum, 472.
Hembra, 349.
Hemp, 614.
——, African, 700.
——, Agra, 181.
——, Ambari, 70, 181.
——, Ambasi, 70.
——, Bowstring, 698, 700.
——, Common, 614.
——, Deccan, 70.
——, Dhunchee, 197.
——, European, 614.
——, False, 181.
——, Indian, 70, 181, 614.
—— -leaved Hibiscus, 70.
——, Manila, 682.
——, Mauritius, 686, 701.
——, Queensland, 66.
——, Rozelle, 74.
——, Russian, 183.
——, Sida, 66.
——, Sisal, 682, 701.
——, Sunn, 183.
——, Tag, 181.
——, True, 181.
—— -weed, Climbing, 382.

Henbane, Egyptian, 493.
Henequen, 682, 684.
—— Verde, 682.
Henna, 185, 322.
Herb of St. Martin, 57.
Herba Santa Maria, 545.
—— tostao 538.
Herbe à Balai, 506.
—— bourrique, 828.
—— au chagrin, 583.
—— de la jouissance, 381.
—— queue de Rat, 518.
Herminiera Elaphroxylon, 199, 463, 765.
Herpestis Monniera, 506.
Herva formigueira, 544.
—— Moira, 484.
—— de Santa Maria, 544.
—— dos Vassires, 506.
Heteropogon contortus, 816.
Hevea brasiliensis, 405, 585.
Hexalobus senegalensis, 50.
Hialoa, 95.
Hiassa-Kala, 798.
Hibiscus Abelmoschus, 69.
—— cannabinus, 70, 72, 74, 111, 181.
——, Changeable Rose, 73.
——, Edible, 71.
—— esculentus, 70, 71, 88, 696.
——, Lime tree leaved, 75.
—— lunariifolius, 72.
—— mutabilis, 72.
—— physaloides, 73.
—— Rosa-sinensis, 73.
—— rostellatus, 73.
—— Sabdariffa, 74.
—— surattensis, 75.
—— tiliaceus, 75.
—— vitifolius, 76.
Hierba hedionda, 259.
Highland Coffee, 367.
Higuera, 507.
Hilo Grass, 824, 825.
Hindi, 79.
Hippocratea indica, 160.
—— obtusifolia, 160.
Hiotan, 330.
Hiro, 427.
Hlafuta, 273.
Hoary Basil, 528.
Hoci dangdur, 601.
Hog Gum, 62.
Hog Millet, 836.
Hog Plum, 157, 177. 178.
Hogweed, 538.
Holarrhena africana, 445.
—— antidysenterica, 446.
—— febrifuga, 446.
—— Wulfsbergii, 446.
Holcus saccharatus, 799.
—— Sorghum, 791.
Holz, Congo, 238.
Homa funtum, 462.
Homalocenchrus hexandrus, 870.
Homohomo, 246.
Honckenya ficifolia, 107, 108, 700.
Honey Grass, 840.
—— Locust, 285.
—— Pod, 285.
Honeysuckle French, 198.
——, Jamaica, 327.
Hon-ma, 614.
Hoové, 525.
Horned Clover, 186.
Horse Bean, 221, 253.
—— -eye-bean, 221.
—— Gram, 207, 234.
—— Nicker, 249.
—— -radish tree, 55.
—— Whip, 68.
Houllé, 281.
Houmime, 531.
Houndieul, 215.
Hounve, 768.
Hsiang Yu, 512.
Huacamotl, 601.
Huanuco Coca, 117.
Hûla, 243.
Humble Plant, 287.
Humidtaradu, 373.
Humiriaceae, 121.
Hungarian Grass, 837.
Hungry Rice, 818.
Hung-Shao, 475.
Hura crepitans, 612.
Hurna, 608.
Hyacinth Bean, 235.
Hyaena's tomato, 483.
Hydranthelium egense, 506.
Hydrocharideae, 653.
Hygrophila spinosa, 380, 514.
Hyparrhenia Barteri, 815.
—— Chrysargyrea, 815.
—— cymbaria, 815.
—— diplandra, 815.
—— notolasia, 815.
—— rufa, 814.
—— Ruprechtii, 814.
—— soluta, 815.
—— —— var. violascens, 815.
— subplumosa, 815.
Hypericineae, 61.
Hyphaene thebaica, 732.
Hyptis pectinata, 533.
—— spicigera, 534.

Iackenu, 273.
Iba, 137.
Ibbeh Kwee, 327.
Ibegogo, 150.
Ibel, 239.

Ibishere, 640.
Ibo, 433, 435, 436, 437.
—— Akitipa, 433.
—— Elekiti, 437.
—— -gidi, 429.
—— Giddi, 434.
—— Tabong, 430.
Iboisa, 595.
Iboru, 820.
Ibu, 444.
Iburu, 820.
Icaquier, 301.
—— d'Amérique, 301.
Ice Vine, 52.
Ichinen-cha, 258.
Idaho Pea, 207.
Idi, 308.
Idiya, 693.
Idofun, 302.
Idogo, 192.
Idogun, 240.
Ifu, 847.
Iganyan Alu, 693.
Igara, 229.
Igba, 483.
Igbale Odan, 353.
Igbeshe, 320.
Igbo, 136, 445.
Igedudu, 424.
Igi-Egba, 304.
—— ira, 355.
—— oguro, 724.
Igmiakia, 285.
Igmiokkra, 285.
Igname à feuilles arrondies, 694.
Igo, 157.
Igongo, 196.
Igoti, 729.
Igoumon, 159.
Igun, 196.
Iguronin, 246.
Ihege, 640.
Ijan or Ijan funfun, 607.
Ije eye, 167.
Ikan, 483, 727, 728.
Ikbawo Opolo, 530.
Ikboago, 809.
Ikbo Mili, 833.
Ikbonta, 827.
Ikhimi, 283, 509.
Iko, 529.
Ikom, 558.
Ikpan, 336.
Ikpa wudu, 297.
Ikpele Oku, 711.
Ikrop Eyop, 735.
Iku, 305.
—— Ekun, 536.
Ikwapobo, 151.
Ilanthai, 162.
Ilasa, 108.
Ile, 581.
Ille Pagini, 274.
Ilorin Balsam, 271.
Ilu egugo egu, 820.
Ilute emji nuono, 851.
Imbilo, 239.
Imbondeiro, 85.
Imbuya, 542.
Imi-esu, 382.
Imkoo, 630.
Immirora, 240.
Imperata arundinacea, 712, 777.
—— cylindrica, 777.
—— —— var. Koenigii, 777.
—— —— —— Thunbergii, 777.
Inane, 861.
Inderab, 469.
—— invaiya, 469.
Indian Almond, 306.
—— Arrowroot, 668.
—— Butter Bean, 235.
—— Cane, 670.
—— Caoutchouc, 623.
—— Coral Tree, 214.
—— Corn, 768.
—— Couch, 855.
—— Dari, 801.
—— Date, 275.
—— Heliotrope, 472.
—— Hemp, 70, 181.
—— Jujube, 161.
—— Laburnum, 257.
—— Liquorice, 209.
—— Millet, 835.
—— Pink, 469.
—— Privet, 322.
—— Reed, 670.
—— Shot, 670.
—— Sorrel, 74.
—— Spinach, 545.
—— Squill, 709.
—— Tamarind, 275.
—— Teak, 519.
—— Turnsole, 472.
—— Walnut, 595.
India-rubber Fig, 623.
Indigo, 192.
——, Eleven-leaved Guinea, 191.
——, Java, 190.
——, Natal, 190.
——, West African, 244.
——, Yoruba, 244.
Indigofera Anil, 192.
—— arrecta, 190.
—— articulata, 190.
—— diphylla, 191.
—— endecaphylla, 191.
—— hirsuta, 191.
—— pulchra, 192.
—— simplicifolia, 192.
—— suffruticosa, 192.
—— tinctoria, 192.
—— umbonata, 190.

Inée, 448, 449.
Ineyinfun, 584.
Inga laurina, 133, 368.
Ingle, 115.
Ingula, 510.
Inguli Baub, 525.
Ingwena Ngulube, 702.
Inhame de St. Thome, 690.
Inhlubu, 232.
Inkontomba, 430.
Innala, 531.
Inobiri, 396.
Inoy, 305.
Insanga, 614.
Insena, 273.
Insinda, 817.
In-Qala, 167.
Intaya, 818.
Ipa, 607.
Ipapo, 246.
Iparote, 545.
Ipeca, 538.
Ipecacuanha, 376, 464.
——, Bastard, 464.
——, Wild Negro, 464.
Ipomoea aquatica, 474.
—— Batatas, 475.
——, Blue American, 480.
—— Bona-nox, 474.
—— digitata, 479.
—— hederacea, 480.
—— involucrata, 480.
—— palmata, 480.
——, Prickly, 474.
—— purga, 480.
—— Quamoclit, 474.
——, Wing leaved, 474.
Ipongo, 222.
Ira, 440, 578.
Iraigbo, 441.
Ira-Odan, 579.
Irawo Ile, 378.
Irawoile, 378.
Ire, 446, 453.
—— Basalasa, 446.
—— -Ibeji, 446.
——, Male of the, 446.
Ireh, 453.
Ireno, 446.
Irideae, 679.
Irifin, 238.
Iroko, 617.
Ironga, 273.
Iron wood, 274.
Ironwood, Dwarf, 139.
Iro-osun-dudu, 241, 244.
Irosun, 241, 246, 247.
Iro-usun-pupa, 241.
Irvingia Barteri, 137.
—— gabonensis, 137.
—— Smithii, 138.
Irriarri, 415.
Iru-ala-ngba, 518.
—— amurin, 518.
Irugba, 281.
Isa, 447, 448, 640.
Isaga, 297.
Isai, 446.
Isanaje igbo, 466.
Isanwi, 426.
Isaquente, 640.
Isa-wewe, 450.
Isepa, 74.
Isha, 450.
—— Gere, 448.
—— Gidi, 447.
—— Giri, 448.
—— Kekere, 450.
Ishin, 167.
Ishiri Jeje, 167.
Isho, 224.
Ishu Ogbugbu, 447.
Isiblaza, 540.
Isinren, 320.
Isitwete, 289.
Isoberlinia, 266.
—— Dalzielii, 267.
—— Doka, 267.
Isombe, 736.
Isonandra Hookeri, 405.
Isonguin, 421.
Issa Arow Poison, 60.
Issanguila, 590.
Issoua, 121.
Istanhe, 788.
Istle, 683.
Isu Awun, 691.
Isumeri, 681.
Ita, 613.
Italian Millet, 837.
—— Senna, 258.
Itchen Masar, 591.
Ito, 329.
Ivioronmila, 736.
Ivory Coast Lump Rubber, 454.
Iwa, 693.
Iwe, 509.
Iwere-jeje, 209.
Iya, 270.
Iyantishmati, 165.
Iya Odan, 271.
Iyawa, 382.
Iyawa Olorun, 696.
Iye, 523.
Iyere, 554.
Iyeri, 453.
Iyeye, 177.
Iyino, 528.
Izeya, 838.
Izibo, 53.
Izkhir, 813.

Jaborandi, 558.
Jaca or Jacca, 644.

Jack Fruit, 644.
—— ——, Hassan, 645.
Jack Tree, 368, 644.
Jacu, 518.
Jadali, 343.
Jaddoho, 862.
Jagive, 322.
Jagwi, 322.
Jalu, 59.
Jama, 806.
Jamaica Honeysuckle, 327.
—— Mignonette, 322.
—— Senna, 258.
Jamalgota, 592.
Jamba, 614.
Jamboo Seed, 201.
Jamestown Lily, 494.
Janari, 802.
Jandunko (Cluster) Rubber, 430.
Jan bako, 809.
—— bauje, 809.
—— -jari, 802.
—— ramno, 809.
—— ranno, 809.
Jangborokun, 711.
Japan, 359.
Japan Clover, 824.
—— Pea, 211.
Japauese Cane, 780.
Jaquier, 645.
Jar dawa, 802.
Jardinea congoensis, 775.
Jarool, 321.
Jarosse, 208.
Jarul, 321.
Jasmin Hediondo, 523.
—— Mangueira, 442.
Jasmine, Red, of Jamica, 442.
—— Tree, 442.
Jatropha Curcas, 593, 655.
—— gossypifolia, 594.
—— multifida, 595.
Jauwi, 148.
Java Indigo, 190.
—— Pepper, 554.
Jawki, 445.
Je-in Joko, 52.
Jema, 806.
Jequerity Seed, 209.
Jequie Maniçoba, 597.
Jerusalem Artichoke, 388.
—— Corn, 794.
—— Oak, 545.
—— Thorn, 253.
Jesuit's Bark, 350.
—— Nut, 325.
Jew's Apple, 483.
—— Mallow, 115.
Jhinga, 331.
Ji, 286.
Jibda Kassa, 52, 551.
Jicara, 507.
Jieghan, 425.
Jigari, 802.
Jihefo or Jihefu, 554.
Jila-Andundo, 492.
Jil-crow-a-berry, 850.
Jimboa, 541.
Jimbundo, 398.
Jimfa, 815.
Jimpa Jimpa, 815.
Jimson Weed, 494.
Jingongono, 438.
Jinguba, 201, 643.
Jinguba de Cambambe, 232.
Jinin-mutum, 473.
Jinjiria, 215.
Jinsonge, 236.
Jipepa, 51.
Jirlahi, 511.
Job's Tears, 774.
Jodo, 59.
Jogbo, 533.
Johnson Grass, 796.
Johore Root, 376.
Jo-Ko-Je, 52.
Jowar, 803.
Juar, 804, 805.
Jubu Jamba, 380.
Juglans regia, 248.
Juiquilite, 192.
Jujube, Indian, 161.
Jumbolekono, 320.
Juncellus alopecuroides, 760.
Jungingi, 398.
Jungle Rice, 830.
Jungli Amba, 178.
Justicia extensa, 515.
Jute, 183.
——, 66, 67, 109, 115.
——, Bastard, 70.
——, Bimlipatam, 70.
——, Chinese, 68, 111.

Kaba, 433.
Kabargiwa, 704.
Kabe, 768.
Kabewa, 330.
Kabumba, 297.
Kachang-Kadele Putik, 211.
Kadainya, 410.
Kadat, 286.
Kadaura, 271.
Kadeji, 627.
Kadige, 141.
Kadyos, 236.
Kaempferia aethiopica, 657.
Kafafogo, 581.
Kafar fakara, 858.
—— gauraka, 858.
Kafe, 402.
Kaffir Manna-Koorn, 844.

Kaffir Orange, 468.
—— Potato, 530.
Kafili, 177.
Kafir, 791, 798.
—— Corn, 792.
Kafumba, 465.
Kagon, 540.
Kagua or Kaguwa, 575.
Kail, 153.
Kaino, 239.
Kainuwa, 754.
Kainya, 425.
Kajalee, 210.
Kajang Koakara, 225.
Kajiji, 760.
Kaju, 175.
Kaka, 282.
Kakalaira, 249.
Kakamut, 291.
Kakasemala, 167.
Kakasenla, 166.
Kakeis, 354.
Kako, 139.
Kakorah, 333.
Kakronda, 383.
Kakung, 280.
Kalat, 777.
Kalefemise, 258.
Kalembo, 161.
Kalgo, 263.
Kali tori, 331.
—— bugi, 774.
Kallai, 229.
Kalu-dana, 480.
Kam, 246.
Kama, 691.
Kamalata, 474.
Kamalinda, 275.
Kambeti, 196.
Kamboro, 438.
Kamdah, 281.
Kam-fakara, 335.
Kamoot, 63.
Kamu, 756.
Kamutt, 452.
Kanabe, 70.
Kanaff, 70.
Kanaspe, 70.
Kanda bark, 51.
Kandala, 833.
Kanderri, 307.
Kaneer, 440.
Kangaroo Grass, 817.
Kangkong, 474.
Kankana, 336.
Kankeliba, 311.
Kan-Kan, 356.
Kansua, 841.
Kamsua, 841.
Kano Leather, 344.
—— Rubber, 630.
Kan-pio, 330.
Kanran, 424, 425.
Kanya, 63.
Kaoliang, 802.
Kapayo, 328.
Kapok, 87.
Kapulaga, 663.
Kara, 275, 286.
Karalsebo, 543.
Karama, 795.
Karamanni Wax, 62.
Karamanta, 487.
Karamui, 331.
Karan dafi, 795.
Karandeffi, 795.
Karangia, 846.
Karangiya, 846.
Karani, 820.
Karan Masallachi, 466.
Karan masallachin Kogi, 762.
Karar, 572.
Kardegi, 287.
Karé, 410.
Kared, 275.
Karelu, 333.
Karet, 623.
Kargo, 263.
Kari, 239.
Karité, 410.
Karkashi, 511.
Karkiebon, 833.
Karku, 279.
Karon Maje, 271.
Karrara, 220.
Karumga, 295.
Kas, 787.
Kásá, 787.
Kasara, 858.
Kasha, 830.
Kasibanti, 860.
Kasinjamtolmera, 425.
Kassa, 196.
Kassoumbo, 392.
Katalabu, 296.
Katasemite, 578, 579.
Katatee, 141.
Katchangtanah, 201.
Katchangtarah, 201.
Katemfe, 667.
Katjang bogor, 232.
Katjang-tana, 201.
Katkura Silk Worm, 306.
Katlahi, 271.
Katra Shim, 222.
Katsaimu, 849.
Katumbar, 209.
Kauli, 290.
Kaura, 802, 803.
Kaurduk, 622.
Kausuwa, 841.
Kavali, 465.
Kavangire, 784.
Kavirondo, 227.

Kavika Tree, 320.
Kawaruru, 232.
Kawaru, 288.
Kawerri, 628.
Kawin, 345.
Kawo, 272, 273.
Kawuri, 627, 628.
Kawuru, 627.
Kaya, 279.
Kayara, 787.
Kaya Kedrang, 252.
Kayu Spang, 252.
Kbandé, 279.
Keeteembee, 263.
Kegr, 427.
Kegr, 428, 763.
Kela, 627.
Keluway, 642.
Kendé bile, 797.
—— blanc, 797.
—— rouge, 797.
Kennema, 838.
Kerana, 572.
Kete-nfe, 667.
Kewattia, 452.
Kewatia, 452.
Kha, 138.
Khabaung, 467.
Khabbal, 855.
Khaboung, 467.
Khadak, 483.
Khai, 308.
Khaki Cotton, 78.
Khamach, 219.
Kharallé, 275.
Khardal, 427.
Khas Khas, 807.
Khavi, 813.
Khaya grandis, 152.
—— Punchii, 152.
—— senegalensis, 152, 153, 521.
Khenna, 322.
Khevet, 768.
Khir, 850.
Khiyar, 335.
Khoti, 345.
Khus-Khus, 807.
Kiakia, 430.
Kiara, 814.
Kibiyar daji, 815.
Kibiya, 787.
Kibbil, 161.
Kiby, 275.
Kickxia africana, 451, 453.
—— elastica, 453.
Kidney Bean, 227.
—— Cotton, 77, 80.
Kief, 614.
Kifabakasi, 510.
Kigelia aethiopica, 510.
—— —— var. bornuensis, 510.
—— africana, 511.
Kigelia pinnata, 511.
Kigere, 641.
Kikuyu Grass, 840.
Kilanjananahary, 536.
Kili or Kile, 627.
Kili, 630.
Kilimbela, 641.
Kimba, 50.
Kimontodoha, 389.
Kina du Rio-Nunez, 343.
Kindee, 509.
Kindi, 487.
King Palm, 737.
Kingwhane, 571.
Kinkaliba, 311.
Kinkelibah, 311.
Kinkelebar, 311.
Kino, 223.
——, African, 239.
—— de Gambie, 240.
——, Gambian, 239.
Kinto, 768.
Kinu Thorny, 512.
Kiranjan, 528.
Kiri Kiri, 855.
Kirman Mint, 527.
Kirni or Kirrne, 578.
Kirundo, 639.
Kishia, 343.
Kishongo or Kisongo, 590.
Kisia, 343.
Kiti, 795.
Kitsongo, 179.
Kittur, 293.
Kittz Tekker, 293.
Kitubalu, 629.
Klude or Klode, 737.
Kobbo, 634.
Kobenoki, 302.
Koberu, 415.
Kobi, 148.
Kobin, 248.
Kobo, 277.
Kobodigansu, 346.
Kobooule, 634.
Kocyto, 261.
Kodageiya, 235.
Kodo Millet, 827.
Kodra, 827.
Koep, 836.
Koffé, 238.
Koffo, 238.
Koghiabera, 304.
Kojoli, 308.
Kokboio, 795.
Kokiya, 468.
Kokka, 299.
Koko, 756.
Kokoh, 299.
Kokomayur, 510.
Kookoomboya, 90.
Koksim, 384.

Kokué, 443.
Kola, Bitter, 63, 64.
——, False, 63.
——, Male, 63.
—— Nut, 607, 667.
—— ——, Orogbo, 63.
Koláles, 284.
Kolales halomtano, 209.
Kolatin, 92.
Kolkol, 293.
Kolokoto, 236.
Komaiya, 854.
Komasimi, 554.
Kombe, 449.
Kombola, 280.
Kondol, 332.
Kondot, 332.
Koo Koon Doo Koo, 475.
Koobi-arri, 415.
Koondeh, 230.
Kordofan Gum, 293.
Korikodi, 95.
Koropo, 184.
Korosso, 724.
Kosa, 787.
Kosain rogo, 693.
Kossa, 597.
Kota-Kota, 79.
Kōto Cha, 258.
Kotolah, 358.
Kottak-Karandai, 384.
Koudou, 148.
Kouikeri, 531.
Koulou-Koulou, 248.
Koumounou, 159.
Koumongou, 159.
Kowri Babul, 290.
Kpokpoka, 444.
Kpoye, 558.
Kratchi, 345.
Kreb, 830.
Krepi, 430.
Krishna Mung, 227.
Krobonko, 329.
Krodyn, 531.
Kromi, 446.
Krufie, 150.
Kubaiwa, 71.
Kube, 729.
Kubewa, 71.
Kubla, 571.
Kubo, 630.
Kuchila, 467.
Kudlee Hoolee, 207.
Kuge, 138.
Kuka, 85.
Kulális, 284.
Kuli, 836.
Kulkul, 264.
Kulla, 571.
Kultáhi-Máh, 234.
Kúlthí, 234.
Kulti, 234.
Kumara, 475.
Kunbanzo, 446.
Kunbar dawaki, 533.
Kunde Miju, 229.
Kundi, 281, 581.
Kundoo Oil, 150.
Kunjit, 512.
Kununguru, 711.
Kuperf, 283.
Kura, 279.
Kurajupong, 380.
Kurbooja, 334.
Kurdee, 392.
Kurna, 161.
Kurna-na-sara, 145.
Kurtum, 392.
Kus, 787.
Kusaba, 617.
Kushument, 437.
Kusoniki, 563.
Kuyon, 519.
Kwakwa, 735.
Kwakwar Attagara, 744.
Kwankwanni, 448, 450.
Kwaranga, 702.
Kweek-Grass, 861.
Kwell, 630.
Kwenuwapi, 287.
Kworia, 330.
Kyamro, 787.
Kyara, 814.
Kyasu, 841.
Kyasuwa, 841.
Kyasuwar rafi, 838.
—— ta fadana, 838.
Kyauro, 787.
Kyinibua, 470.
Kyllingia erecta, 760.
Kymibua, 470.

La'anlopa, 284.
Labiatae, 527.
Lablab Bean, 235.
Laburnum, Indian, 257.
Lac Insect, 161.
Lactuca sativa, 395.
Lado, 79.
Lady's Fingers, 71.
Laebach, 299.
Lagba Ommode, 450.
Lagenaria vulgaris, 330.
Lagerstroemia Flos-Reginae, 321.
Lagos Bass, 725.
—— Biscuit Rubber, 453.
—— Lump ——, 453, 454.
—— Mahogany, 154.
—— Rubber, 635.
—— Silk Rubber, 453, 454, 456, 458, 637.
—— Strip ——, 453.

Lagrimo de Moca, 658.
Laguncularia racemosa, 309.
Laikee, 336.
Laint, 139.
Laintain, 139.
Laket, 338.
Lakose, 51.
Lalang, 712, 777.
—— Grass, 777, 778.
Lali, 322.
Lalle, 322.
Lalloba, 138.
Lalo, 138.
Lamprothamnus Fosteri, 359.
Lamy, 63.
Landolphia comorensis, var. florida, 428.
—— florida, 428.
—— Heudelotii, 74.
—— ——, var. Djenge, 431.
—— owariensis, 74, 429, 430, 658.
—— —— var. Djenge, 431.
—— —— —— nigerina, 431.
—— scandens, 433.
—— senegalensis, 433.
—— Thollonii, 432.
—— Thompsonii, 434.
Language, 12.
Lantana camara, 516, 529.
——, Prickly, 516.
—— salvifolia, 517.
—— trifolia, 517.
Lanzura Grass, 795.
Large flowered Beaumontia, 451.
—— leaved Tobacco, 499.
—— Water Grass, 825.
La Sapotille, 400.
Lasiosiphon hoepfnerianus, 571.
—— Kraussii, 571.
Lasora, 470.
Lasséri, 470.
Laswara, 470.
Latakia Tobacco, 498, 499.
Lathyrism, 208.
Lathyrus sativus, 208.
Laurineae, 562.
La Vigne de Nigritie, 163.
Lawo, 311.
Lawsonia alba, 185, 322.
Laye Igu, 196.
Layu, 869.
—— Sing, 869.
Leadwort, Ceylon, 396.
Leaf, Tea-bush, 529.
Le Baumier Bdellium, 141.
Lebinga, 613.
Ledger Bark, 349.
Leea gumiensis, 165.
—— sambucina, 165.
Leeuja, 844.
Leersia hexandra, 869.
Leguminosae, 179, 249, 280.
Lehoso, 327.
Leichardt Grass, 825.
Lemna polyrhiza, 759.
Lemon, 135.
—— Bay Oil, 316.
—— Grass, 810, 812.
——, Metfords, 135.
—— Scented Eucalyptus, 313.
——, Water, 327.
——, Wild Water, 326.
Lenar batu, 813.
Lenteha fransesa, 236.
Lenubatu Panagiri mana, 812.
Leonotis, Catmint-leaved, 536.
—— nepetaefolia, 536.
Leper's Hand, 342.
Lepidoturus laxiflorus, 606.
Leptadenia lancifolia, 466.
Leroi, 443.
Lerué, 443.
Le Sainfoin à bouquets, 198.
Lespedeza striata, 824.
Lesser Duckweed, 759.
Lesuri, 470.
Lettuce, 395.
Leucaena glauca, 287.
Leucas martinicensis, 536.
Levant Cotton, 77.
Leverek beni, 374.
Liabangmwo, 702.
Liamba, 614.
Liambe, 614.
Liár, 471.
Liberian Coffee, 364.
Libi-dibi, 250.
Libo, 379.
Licongue, 430.
Licorice Weed, 506.
Lila, 518.
Lilac, African, 260.
——, Persian, 145.
Liliaceae, 698.
Lilibue, 430.
Lily, Jamestown, 494.
Lima, 626.
Lime, 132.
—— tree leaved Hibiscus, 75.
——, Sour, 132.
——, Wild, 157.
Limniyar-Kwadi, 657.
Lineae, 116.
Linear leaved Cerbera, 440.
Lindernia diffusa, 506.
Ling, 325.
Lingui, 433, 830.
Linum usitatissimum, 66.
Lippia adoensis, 517.
—— nodiflora, 518.
Liquorice, Indian, 209.
Lisombe, 736, 739.
Litlo, 232.
Litongo, 468.

Little Crowfoot, 861.
Livistona Jenkinsiana, 722.
Lixa, 626.
Lluvia, 518.
Lobiya, 229.
Lobotuje pupa, 594.
Lochnera rosea, 442.
Locust, African, 281.
—— Bean, 262.
——, Honey, 285.
Lodi, 513.
Lodusong, 282.
Loensi, 281.
Loganiaceae, 467.
Logogonee, 287.
Logun-sese, 215.
Logwood, 254.
Loho, 641.
Loko, 617.
Lokokendamba, 263.
Lol, 138.
Lolequel, 736.
Loloopatla, 471.
Lonchocarpus cyanescens, 244.
—— baxiflorus, 246.
—— sericeus, 246.
Long-capsuled Mahogany, 151.
Long Rooted Turmeric, 659.
Loofah, 331.
Lookidge, 384.
Looquajoo, 275.
Lophira alata, 139.
Losa, 596.
Louboungay, 512.
Louisiana Grass, 823.
Love-lies-bleeding, 541.
Loxa Bark, 350.
Lu, 281.
Lubach, 299.
Lubi, 863.
Lubiah, 235.
Lucerne, 186.
——, Paddy's, 66.
——, Provence, 186.
——, Purple, 186.
Lucu or Luco, 859.
Lucula, 243.
Lucuma mammosa, 399.
Luddei, 330.
Luffa, 331.
—— acutangula, 331.
—— aegyptiaca, 331.
Lulu, 410.
Lumbang, 595.
Luoko, 549.
Lusambya, 509.
Lycopersicum esculentum, 480.
Lyon Bean, 219.
—— Velvet Bean, 219.
Lythrarieae, 321.
Maba Mannii, 423.
Maboca, 468.
Maboga, 338.
Mabooboo, 662.
Macaranga hypoleuca, 347.
Macarara, 274.
Macata, 251.
Macella, 383.
Machara, 833, 847.
Machericao, 528.
Machilus Nanmu, 563.
Macho, 349.
Macomgue, 430.
Maconia, 614.
Macrolobium Palisoti, 267.
Macundi, 229.
Mada, 433.
Madagascar periwinkle, 442.
—— Plum, 59.
—— Potato, 531.
Mad Apple, 494.
Made, 433.
Madiada, 842.
Madeira Marrow, 340.
Madera, 98, 197.
Madilo, 275.
Madobia, 244.
Madre de Cacao, 216.
Madura, 197.
—— Shade Tree, 197.
Maerua angolensis, 54.
Mafewobamomi, 482.
Mafoureira, 146.
Mafowo Kaunsonii, 514.
Mafuma, 87.
Mafumeira, 87.
Mafura, 146.
Mafuta, 512.
Magberi, 156.
Magerman, 709.
Maghbash Akhdar, 792.
Magiji, 239.
Magu-Máh, 227.
Magundo, 617.
Mahagai-a, 613.
Mahang Putih, 347.
Maha Panagiri mana, 812.
Maharageh, 235.
Mahareb, 813.
Mahé, 506.
Mahogany, 273, 422.
——, African, 152, 153, 272, 277, 422, 521.
——, Bakum, 421.
—— Bark Tree, 121.
——, Benin, 146, 152, 154.
——, Cameroon, 418.
——, Cape, 146.
——, Gambia, 155.
——, Lagos, 154.
——, Long-capsuled, 151.
——, Manubi, 146.

Mahogany, Natal, 146.
—— Nuts, 419.
——, Rhodesian, 273.
——, Sapele, 154.
——, Swamp, 617.
——, Unscented, 151.
——, West African, 154, 155, 346.
Mahogoni boom, 273.
Maholtine, 67.
Mahopo, 529.
Mahura, 146.
Maidobia, 244.
Maifarin Kai, 839.
Mai Krak, 252.
Mai-Kaindubu, 544.
Maimbola, 390.
Maindee, 322.
Mai Sak, 519.
Maiolo, 48.
Maiwa, 803, 844.
Maize, 768.
Majagua, 75.
Maji, 271.
Majiriyar Karumi, 583.
Majombo, 235.
Makaimi, 334.
Makana Sora, 480.
Makaragwe, 227.
Makarfo, 248.
Makari, 818.
Makarufo, 237.
Makarin fako, 822.
Makbo, 282.
Makerou, 422.
Makõkõle, 227.
Mako, 422.
Makoré, 422.
Makindu, 721.
Ma Kube, 729.
Makudima, 425.
Makuwari, 334.
Malabar Nightshade, 545.
Malacca Cane, 728.
Malay Apple, 320.
Male Fern, 881.
—— Funtum, 452.
—— of the Ire, 446.
—— Kola, 63.
—— Rubber Tree, 446.
Mali, 724.
Malindi, 199.
Mallow, Changing Rose, 73.
——, Country, 68.
——, Jew's, 115.
——, Musk, 69.
Malolo, 48.
Malosa, 251.
Maltese Cotton, 77.
Malulo, 381.
Maluvo, 536.
Maluvo-iamconco, 536.
Maluvo-iamgilla, 536.
Malvaceae, 66.
Mamboga stipulosa, 346.
Mameiro, 327.
Mamieba, 275.
Mammee Sapote, 399.
Mamméne, 288.
Mamon, 327.
Mamrondo, 227.
Mana, 139.
Manan, 452.
Manak, 156.
Manbode, 277.
Manchurian Bean, 229.
Mandiocca, 667.
Mandioca, 601.
Mandram, 490.
Maneo, 327.
Mangel-andûa, 510.
Mangi, 304.
Mangifera africana, 169.
—— gabonensis, 138.
—— indica, 169, 556.
M'angilla, 536.
Manglier gris, 308.
Mango, 169.
——, "Governor," 170.
——, Wild, 137, 169.
Mangold or Mangel, 546.
Mangold Wurzel, 546.
Mangosteen, 65.
Mangouli, 531.
Mangrove, American, 304.
——, Red, 304, 309.
——, White, 309, 527.
Mangue, 352.
Mangue do Monte, 352.
Mani, 201.
Maniba, 601.
Manicoba, Jequie, 597.
——, Piauhy, 600.
—— Rubber, 598.
Manihot dichotoma, 597.
—— Glaziovii, 598.
—— palmata, 601.
—— piauhyensis, 600.
—— ulitissima, 600, 667.
Manila Elemi, 143.
—— Hemp, 674.
Manio, 793.
Manioc, 601.
Manira, 601.
Manisurus granularis, 776.
Manjedua, 634.
Mankani, 756.
Manko, 304.
Manna, 837.
Manniophyton africanum, 596.
Manoh Cubes Rubber, 454.
—— Twist Rubber, 453.
Manterin, 232.
Mantchocongo, 429.
Ma-nturisi, 544.

Manubi Mahogany, 146.
Manufacturers' Bark, 351.
Manunk, 156.
Mapondo, 274.
Maputa, 85.
Marabagunda, 842.
Maragogipe Coffee, 362.
Maragra, 811.
Maragua, 196.
Marakh Twigs, 466.
Maranga, 298.
Maranta arundinacea, 603, 668.
Marasiri, 511.
Marathi, 439, 467, 710.
Marcella, 383.
Margose, 333.
Mariango, 842.
Mariecrabe, 516.
Marike, 308.
Mariscus umbellatus, 766.
Markhamia platycalyx, 509.
—— tomentosa, 509.
—— —— var. gracilis, 509.
Marmalade Plum, 399.
Marodi, 435.
Marokoh, 282.
Marotta, 274.
Marrons d'eau, 325.
Marrow, Madeira, 340.
——, Vegetable, 338.
Marrua, 294.
Marumbi, 859.
Maruru, 753.
Marvel of Peru, 537.
Mao Tsào, 777.
Masakwa, 793.
Masara, 768.
Masakuwa or Massakua, 793.
Masha, 74.
Mashin Zomo, 881.
Masikesi, 263.
Maskwari, 793.
Masoro, 554.
Massagi, 291.
Massango, 842.
Massao or Massaou, 161.
Masson, 161.
Mat, 246.
Mataetae, 847.
Mata de Costa, 222.
Mata de la Playa, 222.
Matagararreh, 338.
Matakwa, 792.
Matambala, 531.
Matamamoso, 209.
Matélé, 531.
Matchbox bean, 282.
Mat Grass, 828.
Matisúl, 536.
Matos, 221.
Matsagge, 264.
Matumbate, 538.
Matuti, 429.
Maulsiri, 420.
Mauritius Bean, 217.
—— Grass, 822.
—— Hemp, 686, 701.
Mawali, 844.
Maweengo-weengo, 198, 842.
Mawkai, 261.
Maxim ia muxito, 223.
Ma-yuen, 774.
Maza, 849.
Mazaggua, 793, 794.
Mazgua, 793.
Mbaba, 422.
Mbabu, 422.
Mbaliki, 608.
Mbana Eyop, 738.
M'banga, 248.
M'beegeeree, 325.
Mbezwa, 298.
Mbili, 353.
M'Bilor, 199.
Mbilor, 199.
Mbkara, 61.
M'booyoo, 330.
Mbopon, 639.
Mbuhu, 842.
Mbungu, 429.
Mbwidi bi, 462.
Mbwidun bwe, 462.
M'chenga, 274.
M'Choonchoo, 138.
M'Comvay, 160.
Mealie Corn, 768.
Mealies, 768.
Means Grass, 796.
Medera, 875.
Mederba, 510.
Meder-deur, 510.
Medlar, Chirinda, 361.
——, Small White, 361.
Medium, Brown of the trade, 431.
Medick, Cultivated, 186.
Medicago falcata, 186.
—— sativa, 186, 859.
—— —— var. polia, 186.
—— —— var. turkestanica, 186.
Meeoleholeh, 164.
Meepampa, 410.
Megasse, 779.
Mekingi, 353.
Meelalla, 729.
Melastomaceae, 321.
Melastoma corymbosum, 321.
Melegueta Pepper, 662.
Melia Azedarach, 144.
Meliaceae, 144.
Meligetta, Bastard, 661.
Melila, 520.
Melinis minutiflora, 840.
Melocanna bambusoides, 878.
Melokych, 115.

Melon, 334.
——, Citron Water, 336.
——, Musk, 334.
——, Netted, 334.
——, Nutmeg, 334.
——, Pumpkin, 338.
——, Sweet, 334.
——, Tree, 328.
——, Tsama Water, 336.
——, Water, 336.
——, White Gourd, 332.
Membo, 723.
Mémé, 156.
Memeluku, 634.
Memeluku, Rubber, 634.
Mendo, 851.
Mémé, 139.
Meni, 139.
Meni Oil, 140.
Menispermaceae, 52.
Merah, Taban, 403.
Mercury, Vegetable, 488.
Merissa, 463.
Mesenna, 297.
Mesquit Bean, 285.
Metabela, 531.
Metal Seed, 260.
Mételé, 531.
Metfords lemon, 135.
Metroxylon Sagu, 722.
Metsatsarh, 569.
Mexican Fibre, 683.
—— Flame Leaf, 575.
—— Poppy, 53.
—— Rubber, 636.
—— Tea, 545.
—— Wheat, 797.
Mfrinkon, 667.
Mgangala, 232.
M'gazoo, 141.
Mgembeh, 237.
Mgunde, 617.
Mgunga, 295.
M'hah, 813.
Mhogo, 601.
Mhowra, 418.
Mi, 433.
Microdesmis puberula, 584.
Mienjak, 215.
Mignonette, Jamaica, 322.
Mikania scandens, 382.
Milk Apple, 400.
—— Bush, 440.
—— bush, 576.
—— hedge, 576.
Milky Cotton Bush, 464.
Millaemathembo, 358.
Millai or Mille, 139.
Millet, Bastard, 827.
——, Brown Corn, 835.
——, Bulrush, 844.
——, Cumboo, 844.
Millet, Ditch, 827.
——, Evergreen, 796.
——, Foxtail, 837.
——, Giant, 802.
——, Ginger, 859.
——, Great, 801, 802, 803,
——, Hog, 835.
——, Indian, 835.
——, Italian, 837.
——, Kodo, 827.
——, Morocco, 796.
——, Pearl, 844.
——, Proso, 835.
——, Shama, 830.
——, Spiked, 844.
——, Tall, 802.
——, Tamba, 859.
Milo, 792, 794, 798, 804.
Milolo, 75.
Mimosa asperata, 287.
——, Bashful, 287.
——, Egyptian, 289.
—— pudica, 287.
Mimoseae, 280.
Mimusops bidentata, 415.
—— Djave, 417.
—— Elengi, 420.
—— lacera, 421.
—— multinervis, 421.
Minga, 289.
Mint, Kirman, 527.
Mirabilis Jalapa, 537.
Miraculous Berry, 667.
—— Fruit of the Soudan, 667.
—— Fruits, 402.
Mirahondi, 239.
Mirango, 338.
Misinmisin-gogoro, 506.
Misimisi, 209.
—— -gogoro, 506.
Missalo, 468.
Mission Grass, 828.
Mitchinin, 859.
Mitracarpum scabrum, 378.
Mitragyna africana, 345.
—— macrophylla, 345.
Mjombo, 275.
Mjugu mawa, 232.
M'Keendambogo, 263.
M'Kolola, 702.
M'Koma, 106.
M'Konazee, 161.
M'Kookoo, 619.
M'Koongen, 619.
M'looloomа, 90.
M'niolola, 165.
M'nyembeh, 248.
Mobala, 280.
Mobele, 142.
Mobero, 360.
Mocassit Seeds, 593.
Mocha Coffee, 362.

Mochan, 558.
Mocha Senna, 256.
Mochi Wood, 214.
Mocusu, 298.
Modah, 699, 700.
Model Farm, Confluence of Niger and Benue, 34.
—— —— Ibadan, 28, 37.
—— —— Lokoja, 39.
Mofanie, 509.
Mogadam, 420.
Mohaden, 549.
Mohamma, 732.
Mohulu hulu, 468.
Moké, 261.
Mokho, 78.
Mola, 303.
Molascuit, 779.
Molasses Grass, 840.
Molassine, 779.
Mollugo Cerviana, 341.
—— Spergula, 341.
Molola Plum, 303.
Molongo, 617.
Molonillo, 536.
Molucca Bean, 249.
Molulu, 381.
Molungo, 216.
Momangi, 617.
Momba periwede, 273.
Mombata, 510.
Momordica balsamina, 333.
—— Charantia, 333.
Moñggo, 226.
Moñggos, 226.
Monkey Apple, 48, 148.
—— Bread Tree, 85.
—— Guava, 425.
—— Nut, 201.
—— Pod, 300.
Monk's Pepper, 525.
Monochlamydeae, 537.
Monocotyledons, 653.
Monocymbium ceresiiforme, 815.
Monodora angolensis, 51.
—— Myristica, 51.
—— —— var grandiflora, 51.
—— tenuifolia, 51.
Monoom, 529.
Monstera deliciosa, 758.
Montomaso, 383.
Moondi, 281.
Moon Flower, 474.
—— plant, 474, 637.
Moorka Tree, 214.
Mootchie Wood, 214.
Moqombire-bire, 239.
Moraceae, 616.
Moreira, 617.
Morelia senegalensis, 359.
Morinda citrifolia, 374, 375.
—— confusa, 373.
Morinda geminata, 374.
—— longiflora, 373, 374.
—— lucida, 374.
Moringa pterygosperma, 55.
Moringeae, 55.
Morintshi, 729.
Morning Glory, 480.
Morocco Leather, 344.
—— Millet, 796.
Morotodi, 138.
Morus indica, 616.
—— mesozygia, 616.
Mosaghani, 287.
Mosonde, 788.
Mossambe, 260.
Mosseque or Mosoque, 814.
Mossoga, 793.
Mósua, 260.
Motangu, 237.
Moth Bean, 224.
Motondo, 274.
Motsakiri, 146.
Mountain Plum, 157.
—— Sweet Cup, 326.
Mousenna, 297.
Mowaleh, 246.
Mowrah, 418.
Moxadeira Brava, 558.
Mozambique Ebony, 237, 238, 427.
—— Gram, 201.
Mozambue, 54.
Mozêmbue, 54.
Mpafu, 142.
Mpande, 232.
Mpandi, 232.
M'Pano, 247.
Mpeva, 614.
Mpewere, 283.
Mpindamuti, 236.
M'Pingo, 237.
M'piga-Kolubu, 295.
M'piwere, 613.
M'poga, 305.
M'pogoi, 305.
M'possa, 266.
Mpoussa, 51.
M'pungee pungee, 163.
M'rambia munga, 842.
M'Salla, 295, 296.
Msasa, 626.
Mseje, 569.
Mtabo, 626.
Mtaburi, 282.
M'tadola, 469.
M'taeloambai, 353.
Mtama-Niope, 797.
M'tamba, 274.
Mtanda Mbo, 438.
M'teendeea, 237.
M'tondo, 297.
Mtoza, 628.
Muange, 297.

Muangue, 243.
Muanza, 285.
Mubafo, 142.
Mubiri, 243.
Mubula, 302.
Mucamba-camba Armoreira, 617.
Mucombe, 248.
Mucuna aterrima, 216.
—— cylindrosperma, 223.
—— Deeringiana, 217.
—— Lyonii, 219.
—— nivea, 219.
—— pruriens, 220.
—— ——, var. utilis, 218, 219.
—— urens, 221.
—— utilis, 218.
Mudus, 281.
Muero, 360.
Mufonju, 237.
Mufubu, 626.
Mugali, 263.
Mugoberere, 273.
Muguenga,' 177.
Muhinge or Mohinge, 157.
Muhoko, 549.
Mukebu, 469.
Mukemyu, 626.
Mukia scabrella, 339.
Mukoka, 569.
Mukonja, 307, 429.
—— Weiss, 307.
Mukonya, 629.
Mukunyu, 629.
Mulberry, Black, 616.
——, Paper, 651.
——, Russian, 616.
Mulemu, 429.
Mule-mule, 358.
Mulende, 425.
Mulôlo, 263.
Mumpingue, 237.
Mummy Apple, 328.
Mumoovinge, 468.
Mumutum sable, 259.
Mutmutun adamelon, 260.
—— palaoan, 260.
Mumuye Gum, 310, 311.
Mun, 229.
Munabiliko, 302.
Mundi, 281, 384.
Munditika, 384.
Muneunza, 283.
Mung, 227, 845.
—— Pulse, 227.
Mungenin, 286.
Muñggo, 226.
Mungo, 346.
Mungolo oamxi, 355.
Munguella, 590.
Mungu-m-cheu, 289.
Munhaneca, 239.
Munhanoca, 259.
Munhiangolo, 438.
Munjiro, 361.
Munvuvoye, 468.
Munwomozi, 525.
Mupanda, 274.
Mupondo, 274.
Mupuluca, 593.
Muramba, 468.
Muranta arundinacea, 170.
Muria, Nbambe, 362.
Murianbambe, 362.
Munjiro, 360.
Murke, 308.
Murmuria, 384.
Musabiri, 640.
Musacamia, 263.
Musa Cavendishii, 670.
—— sapientum, 671.
—— ——, var. paradisiaca, 671.
—— textilis, 68, 674.
Musacosse, 273.
Musamba-samba, 614.
Musanga Smithii, 641.
Muscades de Calabash, 51.
Musel, 817.
Musésse, 353.
Mush Gourd, 338.
Mushunguna, 579.
Musibiri, 640.
Musk Mallow, 69.
—— Melon, 334.
Musolveira, 425.
Mussaenda Afzelii, 355.
—— arcuata, 354.
—— elegans, 354.
—— erythrophylla, 354.
—— Isertiana, 355.
—— luteola, 355.
—— tenuiflora, 355.
Mussana, 297.
Mussonde, 296.
Mussongue, 296.
Mustard Tree, 427.
—— —— of Scriptue, 549.
Musuviri, 640.
Muswak, 427.
Musyabassa, 611.
Mutabo, 626.
Mutafo, 142.
Mutagusi, 282.
Mutaje or Mutuge, 558.
Mutala-Menha, 246.
Mutama, 343.
Mutamba, 468.
Muten-andûa, 510.
Mutenguenandûa, 510.
Mutenti, 138.
Mutete, 239, 582.
Mutonga-tonga, 549.
Mutserrie or M'Tserrie, 579.
Mutugo, 558.
Mutumba, 469.

Mutumbella, 492.
Muvule, 617.
Muxillo-Xyllo, 525.
Muzungo, 283.
Mvoochi, 430.
M'Vooma, 729.
Mwafu, 142.
Mwande, 273.
M'wombeh, 291.
Myene Afia, 541.
Myrianthus arboreus, 640.
Myristica fragrans, 559.
Myristicaceae, 558.
Myrobalans, Egyptian, 138.
Myrtaceae, 312,
Myrrh, African, 141.
Myrtle Berry, 316.

Nabukwi, 469.
Nadi, 281.
Nadou, 231.
Nagazi ya Mahele, 737.
Nagil, 855.
Nagli, 859.
Najas amargas, 118.
—— dulces, 118.
Namare, 264.
Namari, 264.
Namu-Kagu, 453.
Nan Mu, 563.
Nangwesu, 275.
Nankin Cotton, 78.
Nanufo or Nanafo, 540.
Nanujinrinkia, 614.
Napier's Fodder, 842.
Naples Gourd, 338.
Napoleona imperialis, 320.
Napunti, 108, 700.
Naquada, 248.
Naseberry, 400.
Natal Grass, 839.
—— Indigo, 190.
—— Kweek Grass, 861.
—— Mahogany, 146.
—— Tweek Grass, 828.
Natalite, 780.
Native Balata, 635.
Navananji-chapálu, 395.
Nbafo, 142.
Nbondo, 85.
Nchoumbou, 283.
Ndahi, 633.
Ndai, 358.
N'Dargua, 79.
Ndauwi, 302.
Ndawi Badji, 302.
Ndemand, 510.
N'Dendo, 424.
Ndewe, 820.
Ndisimo, 693.
Ndisok, 137, 640.
Ndiyang, 506.
Ndjugu, 201.
N'Dogo, 137.
Ndomi, 711.
N'dota, 248.
Ndote, 236.
Ndougoni, 531.
Ndzugu, 232.
Nebneb, 289.
Nectandra Rodioei, 416.
Negepassa, 244.
Negro Coffee, 259.
Negro Peach, 343.
Neke, 282.
Nela Kodala, 201.
Nemucha, 258.
Nepal Trumpet Flower, 451.
Nephrodium Filix-mas, 881.
Nere, 281.
Neretou, 281.
Neroli Oil, 123.
Nespera, 90.
Nespera d'obo, 90.
Nesuwa, 106.
Nété, 98, 281.
Nettie, 281.
Newapf, 288.
Newbouldia laevis, 508.
Nfamka, 693.
Nfamko, 693.
Ngab, 619.
N'gagna, 220.
Nga-Hire, 257.
Ngalu, 721.
Ngart. 611.
Ngarve Nuts, 419.
Ngeparsa, 244.
N'Gilla, 483, 512.
Ngillasonde, 239.
Ngingwi, 263.
N-golo-mugi, 375.
Ngorokolok, 297.
N'Goula, 239.
Ngoumi, 63.
Ngu, 257.
Nguha, 842.
Nguiguis, 263.
Nguilla, 512.
N'Gunbo, 160.
Nialé, 244.
Niam, 139.
—— Fat, 140.
Niama, 263.
Niamako, 490.
Niamidua, 443.
Nicaraguan Shade Tree, 197.
Nicker, Horse, 249.
—— Nut, 249.
Nicotiana glauca, 495.
—— rustica, 496.
—— Tabacum, 496.

Nicotiana Tabacum var. brasiliensis, 498.
—— —— —— fruticosa, 498.
—— —— —— havanensis, 498.
—— —— —— lancifolia, 498.
—— —— —— macrophylla, 499.
—— —— —— virginica, 499.
Niger Gutta, 630.
Nigger Ball Rubber, 430.
Ningei, 703.
Nil, 192.
Nila-pushpa, 473.
Nilandana hiriya, 185.
Nimeribaka, 443.
Ninkon, 667.
Niole, 768.
Nipa fruticans, 715.
—— Palm, 715.
Nipay, 220.
Nispero Amarillo, 400.
Nitta, 281.
Njabi, 418.
Njama, 232.
N'Jave, 418.
Njogo, 430.
Njombo, 275.
Njore-Njole, 305.
N'Kam, 596.
Nkchtia, 201.
Nokikon, 510.
Nkolimbo, 236.
N'kosa, 596.
Nkpana, 581.
Kkpili, 584.
Nku, 410.
Nkundi, 281.
Nobe, 813.
Nogeito, 540.
Noix de Gouro, 91.
Noix de Kasjoe, 175.
Noix de Medecine, 593.
Nombo, 836.
Nome, 511.
Nongo, 297.
Nonon giwa, 511.
—— Kura, 335.
—— Kurchiya, 573.
Nor, 811.
Nore, 382.
Noyer du Gabon, 159.
Nou, 343.
Noumgou, 418.
Npanda, 274.
N'Safu, 142.
N'Salagui, 374.
Nserere, 630.
Nsopa, 579.
Ntagué, 304.
Ntaguaga, 421.
Ntchawodueh, 540.
Ntion, 529.
N'ton, 761.
Nturabah, 483.
Nubian Senna, 256.
Nui nai, 484.
Numgu, 418.
Numúrdi, 383.
Nungka, 139.
Nut, Bacco, 423.
——, Bambarra Ground, 232.
——, Belgaume, 595.
——, Benzor, 249.
——, Bonduc, 249.
——, Boomah, 612.
——, Candle, 595.
——, Cashew, 175.
——, Dika, 137.
——, Earth, 201.
——, Fever, 249.
——, Goober, 201.
——, Grass, 766.
——, Ground, 201.
——, Jesuits', 325.
——, Monkey, 201.
——, Nicker, 249.
——, Pea, 201.
——, Physic, 249, 593.
——, Pindar, 201.
——, Poison, 467.
——, Purging, 593.
——, Rush, 761.
——, Sedge, 761.
——, Singhara, 324.
——, Tallow, 157.
——, Tiger, 761.
——, Zulu, 761.
Nutmeg, 559, 560.
——, American, 51.
——, Calabash, 51.
——, Tree, Wild, 558.
——, Melon, 334.
Nuts, Cali, 221.
——, Gnar, 325.
——, Mahogany, 419.
——, Ngarve, 419.
——, Shea Butter, 419.
Nutta, 281.
Nux-Vomica, 467.
Nwatia, 727.
N-xilica, 528.
Nyakampete, 192.
Nyankumati, 359.
Nyaron, 483.
Nyaung, 623.
Nyctage Faux Jalap, 537.
Nyctagineae, 537.
Nyedua, 632, 633, 634, 635.
Nyedua-Djidua, 635.
Nyiad, 724.
Nyika, 295.
Nyin, 768.
Nymphaea Lotus, 52.
Nymphaeaceae, 52.
Nzedua, 632.

Nzonogwi, 106.
Nzonomo, 670.

Oak, African, 139, 580.
——, Bull, 650.
——, Forest, 650.
——, Jerusalem, 545.
——, Scrubby, 139.
——, She, 650.
——, Silky, 570.
——, Swamp, 650.
Oanka, 141.
Oapottoa, 627.
Oasis Alfalfa, 186.
Oats, Wild, 816.
Oba, 137.
Obabit Iwa, 693.
Obachi, 431.
Obada, 634.
Obeche, 105.
Obo, 279.
Obokka, 87.
Oboqui, 178.
Oburo, 661.
Ochnaceae, 139.
Ochro, 71, 88, 696.
Ochrocarpus africanus, 65.
Ocimum americanum, 528.
—— basilicum, 527.
—— canum, 528.
—— gratissimum, 528.
—— suave, 528.
—— viride, 516, 528.
Ocoto, 512.
Ocperdo, 680.
Ocua, 640.
Odahuma, 283.
Odello, 397.
Odenya, 284.
Odifonga, 199.
O'Dika, 137.
Odina acida, 177.
—— antisorbutica, 177.
Odi Oban, 320.
Odo, 696.
Ododo oko, 480.
Odonomokyuku, 144.
Odoumanki, 510.
Odum, 617.
Odunkun, 475.
Odunkun fanfun, 475.
Odundun Odo, 390.
Odunkun-pupa, 475.
Odwen, 246.
Oeduema, 641.
Oenocarpus Bacaba, 376.
Oeil de bourrique, 221.
Offenmah, 584.
Offioniola, 436.
Offonkwari, 436.
Offram, 307.
Ofika, 641.
Ofo-odon, 76.
Ofrafraha, 283.
Ofruntum, 453.
Ofu, 639.
Ofuntum, 453.
Ogaba, 268.
Ogagan, 578.
Ogagouma, 285.
Ogagoumé, 285.
Ogan, 312.
Ogandudu, 310.
Ogangan, 578.
Ogan funfum, 312.
Ogano, 50.
Ogan pupa, 426.
Oganwo, 152.
Ogayouma, 285.
Ogbagba, 630.
Ogbagba Rubber, 630.
Ogbe agun fon, 854.
Ogbogbo, 277, 634.
Ogbun, 527.
Ogbwe Akukaw, 472.
Ogea, 269, 270.
Ogedudin, 737.
Ogia, 268.
Ogidogbo, 373.
Ogiedi, 737.
Ogioloba, 373.
Ogohen, 641.
Ogouwa, 346.
Ogua, 640.
Ogudugbu, 443.
Ogue, 640.
Oguja, 268.
Ogurobe, 283.
Ogwangu, 152.
Ogwango or Ogwangu, 153.
Ogwega, 261.
Ogwi, 169.
O'heso, 298.
Ohiorme, 261.
Ohonton, 639.
Ohyeali, 727.
Oil of Akee, 168.
—— —— Ben, 56.
—— —— Bergamot, 123.
—— —— Betu, 138.
——, Cardol, 175.
——, Cashew Apple, 175.
——, Crab, 148.
——, Exile, 440.
——, Lemon Bay, 316.
—— of Limette, 134.
——, Meni, 140.
—— of Neroli, 123.
——, Orange, 123.
——, Palm, 94, 98.
——, Touloucouna, 150.
——, Wood, 271.
——, Zachun, 138.

Oil, Zawa, 140.
Ojina, 735.
Ojo, 711.
Ojo de Buey, 221.
Ojuologbo, 373, 374.
Okaesin, 854.
Okakan, 728.
Okan, 284, 311.
Okao Koodo, 590.
Oka Olongo, 849.
Okebuni, 820.
Okerli, 137.
Okha, 87.
Oko-aja, 444.
Okobogu Oji, 712.
Okola, 50.
Okovkoko, 670.
Okparukpu, 735.
Okporo Eyop, 735.
Okporokpo, 735.
Okporo Oyop, 735.
Ok-porukpu, 735.
Okra, 71.
Okukon, 721.
Okun, 721.
Okwa, 640.
Okwen, 274, 590.
Okwikwiro, 167.
Okwokwi, 510.
Olacineae, 157.
Oldenlandia globosa, 354.
—— Heynei, 353.
—— senegalensis, 353.
Oldfieldia africana, 580.
Oleander, Yellow, 440.
Olive, Wild, 157.
Olobontjie-pipa, 594.
Olodi, 710.
Ologun wun sheshe, 215.
Oloko, 617, 696.
Olourn, 524.
Olute, 436.
Oluwa, 729.
Ol-wukutaa, 297.
Omartwa-nini, 449.
Ombéné, 91.
Omel Barka, 141.
Omimé, 531.
Ommo, 470.
Ommode, 444.
Omo, 470.
Omon, 470.
Omowewe, 470.
Omphalocarpum elatum, 408.
—— procerum, 408.
—— Radlkoferi, 408.
Omphalogonus nigritanus, 462.
—— calophyllus, 462.
Om Shutur, 510.
Om Suf, 830.
Omukusu, 581.
Ona, 693.
Onage, 449.
Onagrarieae, 324.
Onanakuku, 142.
Onaye, 448, 449.
Oncoba spinosa, 58.
Oncocalamus acanthocnemis, 727.
——, Mannii, 727.
Ondi, 541.
One-seeded cucumber, 340.
Onica Olona, 766.
Onigo, 239.
Onion, 705.
Onitsha Plantations, 36, 37.
Onora ba, 307.
Onumu, 142.
Onwa, 664.
Ookwe, 590.
Ooleyzei, 859.
Opachala, 98.
Opaga, 280.
Opa iku, 260.
Opapao, 272.
Opauk, 307.
Ope-arunfo, 736.
—— Ifa, 737.
—— Kankana, 703.
—— Pamkova, 735.
Opepe, 308, 343.
Opepiah, 582.
Ophiocaulon cissampeloides, 325.
Ophioglossum vulgatum, 881.
Oplismenus africanus, 832.
—— Burmannii, 832.
—— Crus-Pavonis, 830.
—— hirtellus, 832.
—— stagninus, 831.
Opochala, 280.
Opogga, 280.
Opoponax, 292.
Opoto, 619.
Opotto, 627.
Oqua, 640.
Orange, Bigarade, 122.
——, Bitter, 122.
—— Flower-Water, 124.
—— Grass, 810.
——, Kaffir, 468.
—— Oil, 123.
——, Seville, 122.
——, Sweet, 122.
Orchideae, 653.
Ordeal Bark, 279.
—— Bean, 224.
Ore, 526.
Ori, 526.
Oriental Ebony, 299.
Ori eta, 526.
Orikoteni, 178.
Ori-nla, 525.
Ori-oka, 339.
Oriri, 526.
Ormosia laxiflora, 248.

Oro, 137, 430, 639, 641.
Oroba, 303.
Orogbo Kola-nut, 63.
Oroko, 617.
Orombe wewe, 132.
Orombo, 122.
Orozuz, 506.
Orumon, 357.
Orungo, 379.
Oruru, 510.
Oruwo, 375.
Oruwon, 357.
Oryza sativa, 862.
Osan-Agbalumo, 397.
Osangbalumo, 397.
Osan Lakuregbe, 131.
Osere, 157.
Osese, 452.
Oshe, 85.
Oshekpotufunfua, 66.
Oshoor, 463.
Oshr, 463.
Oshun-Shun, 60.
Osia, 270.
Osi Ata, 846.
Osisirin, 510.
Ositwa, 247.
Osoekurunyi, 861.
Osok Eyop, 735.
Ossani, 246.
Osshosha, 285.
Osu, 440.
Osuka, 735.
Osun, 241.
—— Buke, 703.
—— -dudu, 244.
—— Pupa, 241, 244.
Otaheite Potato, 691, 694.
Ote, 558, 641.
Otien, 397.
Otili, 236.
Otimbalilo, 409.
Otokobakar, 263.
Otonta, 433.
Otopí, 433.
Otoukpo, 430.
Ottaekwari, 436.
Ottafrifredi, 430, 433, 462.
Ottapabeku, 433.
Ottarniaha, 436.
Ottogwi, 437.
Otwa, 246.
Ouennyi, 437.
Oule, 281.
Oullé, 281.
Oumimé, 531.
Ounoudo, 441.
Oureri, 418.
Ousounifing, 531.
Oussou-ni-fing, 531.
Oussou-ni-gué, 531.
Ovala, 148.
Ovengi, 437.
Overlook Bean, 221.
Oviakuku, 524.
Oviaruzo, 578.
Owala, 280.
Owama, 590.
Owawa, 105.
Owawe, 307.
Owega Fufu, 225.
Owinu, 246.
Owowe, 298.
Owu, 79.
Owusia, 611.
Ox-eye-bean, 221.
Oxyanthus speciosus, 358.
—— tubiflorus, 358.
Oxytenanthera abyssinica, 875.
Oyale, 571.
Oyiz, 270.
Ozaba, 270.
Ozia, 270.
Ozonga, 121.
Ozoroa insignis, 168.

Pabarpani, 472.
Paburpani, 472.
Pacao, 249.
Pachylobus edulis, 141.
Pachyrhizus angulatus, 232.
—— tuberosus, 233.
Paco de Golungo Alto, 352.
Paddy's Lucerne, 66.
Pago, 75.
Pahe, 851.
Pai, 484.
Paico, 544.
Pai-mei-Tow, 211.
Paiyin, 229.
Pakeo, 249.
Palangpalang, 221, 222.
Palan-palan, 496.
Palaquium Gutta, 397, 403, 415.
Palas, 222.
Palaver Sauce Plant, 512.
—— Tree, 471.
Pale Bark, 350.
—— Catechu, 347.
Palm, African Fan, 729.
——, Bamboo, 724.
——, Betel Nut, 712.
——, Black Run, 729.
——, Catechu, 712.
——, Coco-Nut, 731, 744.
——, Date, 717.
——, Dom or Doum, 733.
——, Dum, 733.
——, Dwarf Coco-Nut, 744.
——, Ejow, 713.
——, Ginger Bread, 733.

Palm, Gomuti, 713.
——, Hard Shell Nut, 735.
——, Ivory Nut, 729, 733.
——, King, 737.
——, Nipa, 715.
——, Oil, 735.
——, Palmyra, 729.
——, Rattan, 728.
——, Sacred, 737.
——, Sago, 713, 722.
——, Shell-less, 737.
——, Soft-Shell, 736.
——, —— -Nut, 737.
——, Spineless Sago, 722.
——, Sugar, 713.
——, Tombo, 724.
——, Thin-Shell Nut, 736.
——, Vegetable Ivory, 729, 733.
——, Water Coco-Nut, 715.
——, West African Oil, 735.
——, White Oil, 735.
—— Wine, 723, 724.
Palma Christi, 608.
—— ——, common, 608.
Palmae, 712.
Palmier Fetiche, 737.
Palmyra Palm, 729.
Paloura, 262.
Pampelmouse, 129.
Pana, 754.
Panacoco, 209.
Panagiri mana, 812.
Panchu-dub, 653.
Panda, 246, 274.
Pandaneae, 753.
Pandanus Candelabrum, 753.
—— Heudelotianus, 753.
Pandi, 541.
Panicum africanum, 832.
—— albidulum, 833.
—— americanum, 844.
—— anabaptistum, 832.
—— asperrimum, 835.
—— barbinode, 822.
—— Burgu, 831.
—— colonum, 830.
—— compositum, 832.
—— Crus-Pavonis, 830.
—— Dactylon, 854.
—— Dregeanum, 833.
—— fluitans, 829.
—— falciferum, 822.
—— frumentaceum, 830.
—— gayanum, 819.
—— hirtellum, 832.
—— insculptum, 829.
—— interruptum, 836.
—— jumentorum, 835.
—— laetum, 833.
—— leiogonum, 836.
—— loliaceum, 832.
—— longijubatum, 833.
Panicum maximum, 833.
—— miliaceum, 835.
—— miliare, 833.
—— muticum, 781, 822, 834.
—— pyramidale, 765, 830.
—— proliferum, 833.
—— repens, 836.
—— stagninum, 831.
—— subalbidulum, 833.
—— subalbidum, 832.
—— uniglume, 821.
Panjangusht, 525.
Pao Cababa, 613.
—— Ferro, 274.
—— Formigo, 359.
—— Musence, 283.
—— Quibaba, 613.
Papagan, 420.
Papai, 327.
Papan, 298.
Papao-Baum, 272.
Papaveraceae, 53.
Papaw, 328.
Papaya, 327.
Papayo, 327.
Papengaye, 331.
Paper Mulberry, 651.
Papilionaceae, 179.
Paprika, 491.
Papuan Teak, 520.
Papyrus, 764.
Para Cress, 389.
—— Grass, 822, 834.
—— Rubber, 585, 636.
Paradaniellia Oliveri, 270.
Paradise Flower, 251.
Paragol, 769.
Paramatta Grass, 850.
Pararu, 232.
Parasolier, 641.
Parata-Eboo, 415.
Parinarium curatellaefolium, 302.
—— excelsum, 302.
—— macrophyllum, 303.
—— Mobola, 303.
—— oblongifolium, 520.
—— polyandrum, 303.
—— robustum, 303.
Pariti tiliaceum, 75.
Parkia africana, 98.
—— biglobosa, 281.
—— filicoidea, 281.
Parkinsonia aculeata, 253.
Pascua, 575.
Paspalidium geminatum, 829.
Paspalum compressum, 823.
—— conjugatum, 824.
—— dilatatum, 824, 857.
—— distichum, 827, 828.
—— exile, 818.
—— Hairy Flowered, 825.
—— longiflorum, 818, 821, 827.

Paspalum scrobiculatum, 827.
—— —— var. Commersonii, 827.
—— —— —— frumentaceum, 827.
—— —— —— polystachyum, 827.
—— vaginatum, 827.
Passiflora edulis, 325.
—— foetida, 326, 712.
—— laurifolia, 327.
—— macrocarpa, 327.
—— quadrangularis, 326.
Passifloreae, 325.
Paste Rubber, 433, 437.
Patagonian Bean, 221.
Patat, 475.
Patato, 475.
Patchouli, 535.
Patchouly of European Commerce, 535.
Patmagi, 527.
Patonmo, 121.
Paucine, 280.
Pauco, 280.
Pauia, 430.
Paullinia pinnata, 166.
Payun payun, 518.
Pea, Angola, 236.
—— Banana, 218.
——, Banana Stock, 218.
——, Blue, 210.
——, Chick, 207.
——, Congo, 236.
——, Cow, 99, 229.
——, Egyptian, 207.
——, Field, 218.
——, Garden, 209.
——, Heart, 165.
——, Idaho, 207.
——, Japan, 211.
—— Nut, 201.
——, Pigeon, 99, 236.
Peach, African, 343.
——, Negro, 343.
—— Root, 344.
—— Tree, 168.
Peachwood, 254.
Peacock's Crest, 251.
Peacock Flower, 251.
Pear, Alligator, 567.
——, Avocado, 567.
——, Guava, 315.
——, Vegetable, 340.
——, Balsam, 333.
Pearl Barley, 774.
—— Millet, 844.
Pecego, 168.
Pecegueiro, 168.
Péchi, 453.
Pedaliaceae, 511.
Pé de galinha, 860.
Pempene, 430.
Penicillaria spicata, 844.
Pennisetum clandestinum, 840.
Pannisetum Benthamii, 842.
—— holcoides, 841.
—— longistylum, 840.
—— —— var. clandestina, 840.
—— pedicellatum, 841.
—— polystachyum, 841.
—— purpureum, 842.
—— setosum, 841, 842.
—— spicatum, 844.
—— typhoideum, 803, 843, 844.
Pen-Shao, 475.
Pentaclethra macrophylla, 98, 137, 280.
Pentadesma butyracea, 62.
Peoples, 12.
Peperomia pellucida, 558.
Pepper, 347.
——, Alligator, 661, 662.
——, African, 50.
——, Annual, 490.
——, Ashantee, 554.
——, Bell, 491.
——, Benin, 554.
——, Betel, 197.
——, Betle, 553, 712.
——, Bird, 490.
——, Black, 556.
—— ——, of W. Africa, 554.
—— Bush, 555.
——, Cayenne, 490.
——, Guinea, 490.
——, Java, 554.
——, Melegueta, 662.
——, Monk's, 525.
——, Red, 490.
——, Sauce, 491.
——, Spur, 490.
——, White, 556.
Pepinella, 340.
Pepitio, 209.
Perfume Grass, 810.
Pergularia africana, 466.
Periploca nigrescens, 462.
Peristrophe bicalyculata, 516.
Periwinkle, Madagascar, 442.
Pernambuco, 640.
Peronia, 209.
Perotis latifolia, 849.
Perpulut, 535.
Persea gratissima, 567.
Persian Dari, 801.
—— Lilac, 145.
Peruvian Bark, 350.
—— Coca, 117.
—— Cotton, 79.
Pervenche, 442.
Pesin, 452.
Petan, 265.
Petang, 265.
Pétigué, 433.
Petit pois pouilleux, 220.
Peto, 802.

Phalwara, 409.
Phaseolus aconitifolius, 224.
—— adenanthus, 225.
—— lunatus, 225.
—— Mungo, 226.
—— radiatus, 227, 845.
—— vulgaris, 227.
Phleum pratense, 801, 839, 856, 857.
Phodia, 497.
Phoenix dactylifera, 717.
—— reclinata, 721.
Phragmites communis, 847, 848.
—— —— var. flavescens, 848.
Phrynium Benthami, 667.
—— confertum, 669.
—— ramosissimum, 667.
—— textile, 669.
Phunat, 383.
Phyllanthus amarus, 582.
—— discoideus, 582.
—— floribundus, 583.
—— Niruri, 583.
—— pentandrus, 583.
—— reticulatus, 583.
Physalis angulata, 487.
—— minima, 487.
—— peruviana, 488.
Physic Nut, 249, 593.
Physical Features, 2, 8.
Physostigma cylindrosperma, 223.
—— venenosum, 221, 223.
Phytolaccaceae, 549.
Phytolacca dioica, 550.
—— dodecandra, 549.
Pia, 688, 689.
Piassava, African, 724, 725.
—— Palm, 725.
Piauhy Manicoba, 600.
—— Rubber, 600.
Picapica, 220.
Picralima, Klaineana, 439.
Pien Ton, 235.
Pigeon Pea, 99, 236, 368.
Pignon d'Inde, 593.
—— de Barbarie, 593.
Pigweed, 61, 538, 542.
——, Sweet, 545.
Pila-Kanér, 440.
Pili, 816.
Pimenta, 554.
—— acris, 316.
—— ——, var. citrifolia, 316.
—— de Tabasco, 318.
—— officinalis, 317.
Pimento, 317.
—— Grass, 828.
Pimiento, 490.
Pinang, 712.
Pindar Nut, 201.
Pine Apple, 676.
Pingo, 237.
Pinhoen, 595.
Pipe Calabash, 330.
Piper Betle, 197, 552.
—— Cubeba, 553.
—— guineense, 554.
—— nigrum, 347, 553, 663.
—— umbellatum, 558.
Piperaceae, 552.
Piptadenia africana, 283.
Pipybras, 506.
Piquant, Camara, 516.
Pishamin, 437.
Pisonia aculeata, 539.
Pistache de terre, 201.
Pistia stratiotes, 754, 765.
Pisum sativum, 209.
Pita, 682.
Pithecolobium altissimum, 300.
—— Samau, 94, 98, 300.
Pitpapra, 516.
Pizat-i-dashti, 709.
Plant, Egg, 483.
——, Humble, 287.
——, sensitive, 287.
——, West Indian Cow-itch, 220.
Plantain, 671.
Plantations, Onitsha, 36.
——, Royal Niger Co., 35, 36.
Plas, 222.
Platanillo, 464.
Platycerium aethiopicum, 881.
Plav, 848.
Plectranthus Coppini, 531.
—— floribundus, 530.
—— —— var. longipes, 530.
—— rotundifolius, 531.
—— ternatus, 531.
—— tuberosus, 531.
Plectronia Afzeliana, 359.
—— glabriflora, 359.
Pleiocarpa mutica, 439.
Pleomele fragrans, 704.
Plukenetia conophora, 611.
Plum, Batoko, 59.
——, Black, of Sierra Leone, 525, 526.
——, Blood, 177.
——, Coco, 301.
——, Egg, 161.
——, Ginger-bread, 303.
——, Gray-skinned, 302.
——, Hog, 157, 177, 178.
——, Madagascar, 59.
——, Marmalade, 399.
——, Mobola, 303.
——, Mountain, 157.
——, rough-skinned, 302.
——, Sapodilla, 400.
——, Seaside, 157.
—— Tomato, 488.
——, Yellow Spanish, 177.
Plumbago zeylanica, 396.
Plumbaginaceae, 396.

Plumeria rubra, 442.
Poa Eragrostis, 853.
Poaya, 376.
Podococcus Barteri, 713.
Pods, Gambia, 289.
Pod, Honey, 285.
——, Monkey, 300.
Poga oleosa, 305.
Pogostemon Cablin, 534.
—— Patchouli, 534.
Pois d'Achery, 225.
—— doux, 133.
—— Mascate, 217.
—— noir de Bourbon, 217.
Poinciana pulcherrima, 251.
—— regia, 252.
Poincillade, 251.
Poison Nut, 467.
—— Tree, 612.
Polyadoa Elliottii, 440.
—— umbellata, 440.
Polygaleae, 59.
Polygonaceae, 550.
Polygonum Fagopyrum, 550.
—— senegalense, 550.
Polypetalae, 47.
Polynesian Ironwood, 650.
Polystictus versicolor, 881.
Pomegranate, 323.
Pompola, 86.
Ponguendole, 429.
Poor Man's Bean, 235.
Poospatta, 282.
Pop Corn, 770.
Popa, 346.
Poponde, 558.
Popondo, 221.
Poponla, 221.
Poppy, Mexican, 53.
——, Prickly, 53.
Popripo, 90.
Pore, 431.
Portmanteau Gourd, 338.
Portulaca oleracea, 61.
—— quadrifida, 61.
Portulaceae, 61.
Postal, 15.
Potato, 485.
——, China, 756.
——, Fra-Fra, 531.
—— Gum, 577.
—— Gutta, 577.
——, Hausa, 531.
——, Kaffir, 530.
——, Madagascar, 531.
——, Otaheite, 691, 694.
——, Salaga, 531.
——, Spanish, 475.
——, Sweet, 475.
Potiron, 338.
Po-tzu, 470.
Poudreaux vers ou Brainvilliers, 469.
Powder, Curry, 491.
Poyadua, 453.
Pran pran, 298, 300.
Prayer Beads, 209.
Prekese, 285.
Pri, 452.
Prick the knee, 514.
Prickly Amaranth, 542.
—— Bur Grass, 846.
—— Calalu, 542.
—— Caterpillar, 542.
—— Chafflower, 543.
—— Ipomoea, 474.
—— Lantana, 516.
—— leaved elephant's foot, 381.
—— Poppy, 53.
Pride of India, 145.
Privet, Egyptian, 322.
——, Indian, 322.
Proso Millet, 835.
Prosopis juliflora, 285.
—— oblonga, 286.
Proteaceae, 569.
Protodon, 279.
Provence Lucerne, 186.
Provinces, 2, 5.
Prune-coton, 301.
—— de l'anse, 301.
Pseudo Colocynthis, 329.
Pseudocedrela Kotschyi, 155.
Pseudo Coloquinta, 329.
Psidium Cattleyanum, 316.
—— Guayava, 315.
Psophocarpus longepedunculatus, 233.
—— tetragonolobus, 234.
Psorospermum febrifugum, 61.
Psychotria Ipecacuanha, 375, 380, 464.
Pteridium aquilinum, 880.
Pteris Aquilina, 880.
Pterocarpus erinaceus, 239.
—— esculentus, 240.
—— lucens, 240.
—— Marsupium, 223, 239.
—— Osun, 241.
—— santalinus, 796.
—— Soyauxii, 241, 242, 796.
—— sp., 244.
—— tinctorius, 242, 243.
Puakani, 221.
Pucha-Pat, 535.
Pudding Pipe Tree, 257.
Pulai Pawi, 580.
Pulguiera, 593.
Pulicaria crispa, 384.
Pulse, The Mung, 227.
Pulza, 593.
Pumelo, 129.
Pumpkin, 338.
——, Ash, 332.
——, Melon, 338.

Pumpkin, White, 330.
Pumpuni, 430.
Punatsu, 653.
Puni, 453.
Punica granatum, 323.
Purging Cassia, 257.
—— Croton, 592.
—— Fistula, 257.
—— Nut, 594.
Purple fruited Guava, 316.
—— —— Passion Flower, 326.
—— Lucerne, 186.
Purqueira, 593.
Purslane, 61.
Purub, 457.
Pushini-Kaia, 338.
Pycnanthus Kombo, 558.
Pycnocoma macrophylla, 611.
Pymma, 321.

Qaoon, 334.
Qara Magreby, 338.
Qara Soudani, 338.
Qara Stambouly, 338.
Qruime, 509.
Quagga Quick, 855.
Quaker-buttons, 467.
Quamoclit coccinea, 474.
—— vulgaris, 474.
Queen of Flowers, 321.
Queensland Arrowroot, 670.
—— Hemp, 66.
Quiapo, 754.
Quibosa, 106.
Quicange, 640.
Quifuge, 282.
Quijanána, 116.
Quimbombo, 71.
Quimbumba, 533.
Quimdembia, 90.
Quina, 446.
Quinbumbo, 533.
Quinbungu, 533.
Quinine, African, 343.
—— des Noirs, 381.
Quinquina africain, 343.
Quinsonge, 236.
Quisaca, 601.
Quisafu, 57.
Quisanani, 116.
Quisqualis indica, 312.
Quitoco antiscorbutico, 383.
Quitundo, 169.

Racca, 106.
Raffia Palm, 724.
Ragi, 859.
Raguet-francois, 382.
Rahaina, 511.
Rahar-Máh, 236.
Rainfall, 11.
Rain Tree, 300.
—— —— of Moyobamba, 301.
—— —— —— Peru, 301.
Raiz de Moro, 807.
Raka, 106.
Rake, 779, 781.
Rama, 69, 72.
Ramba, 468.
Rambong, 623.
Ramdana, 541.
Rami, 647.
Ramie, 647.
Ramma, 72.
Ramno, 809.
Rand, 264.
Randa, 264.
Randia dumetorum, 357.
—— genipaeflora, 355.
—— macrantha, 355.
—— maculata, 356.
—— malleifera, 356.
—— nilotica, 357.
—— octomera, 357.
Rangoon Creeper, 312.
Ranunculaceae, 47.
Rapasa, 572.
Raphia Hookeri, 723.
—— vinifera, 723, 725.
Rapoko Grass, 861.
Rascamoño, 536.
Rati Seed, 209.
Ratsbane, 156.
Rats-bane, 489.
Ratt, 310.
Rat-tail Grass, 850.
Rattan, 728.
Ratte-nooge, 623.
Ratua, 850.
Rauch Apfel-Kraut, 494.
Rauwolfia vomitoria, 440.
Rawaye, 57.
Rawodue, 540.
Red Bead Tree, 284.
—— Ball Rubber, 436.
—— Bark, 350.
—— Camwood, 241.
—— Cinnamon, 316.
—— Gambia Rubber, 630.
—— Head, 464.
—— Jasmine of Jamaica, 442.
—— Kano Rubber, 630.
—— Mangrove, 304, 309.
—— Pepper, 490.
—— Peruvian Cotton, 79.
—— Sandal-Wood, 284, 795.
—— Sorrel, 74.
—— -top, 839.
—— Water tree, 279.
Redwood, 242, 243, 252.
Reed, Common, 847.

Reed, Indian, 670.
Reko Zhiko, 617.
Rekureku, 206.
Rere, 259.
Réséda de Cayenne, 322.
Retama, 253.
Rhamneae, 161.
Rhea, 646.
Rhizophora Mangle, 304.
—— —— var. racemosa, 304.
—— mucronata, 304.
—— racemosa, 304, 527.
Rhizophoreae, 304.
Rhodes Grass, 826, 857.
Rhodesian Mahogany, 273.
—— Timothy, 836.
Rhus insignis, 168.
Rhymay, 642.
Rhynchosia minima, 237.
Rhytachne congoensis, 775.
Riamba, 614.
Ribbon Cane, 779.
Rice, 862.
—— Bean, 229.
—— Corn, 797.
——, Egyptian, 797.
——, Hungry, 818, 827.
——, Jungle, 830.
——, Wild, 830.
Ricinodendron africanum, 590.
Ricinus communis, 607
—— —— var. africana, 608.
—— —— —— benguelensis, 608.
—— —— —— genuina, 608.
—— —— —— megalosperma, 608.
Ricola, 512.
Ridi, 511.
Rigar biri, 163.
Rima, 642.
Rimi, 87.
Rimo, 78.
Ringworm Shrub, 257.
Rinrin, 558.
Rio Nunez Coffee, 366.
—— —— Niggers, 430.
Risga, 530.
Rispero, 400.
Rituti, 429.
Rivers and Waterways, 4, 9.
Roba, 830.
Robusta Coffee, 366.
Rock Elm, 617.
Roempoet-lalampoejangan, 836.
Rogbo Agutan, 711.
Rogo, 600.
Rogon biri, 693.
Roko bokun, 639.
Rokko, 617, 632.
Romba, 528.
Ronier, 729.
Rooi Grass, 817, 818.
Root, Johore, 376.
Root rubber, 431, 436, 437.
——, Yellow Fever, 343.
Rosaceae, 300.
Rose Apple, 319, 369.
Roseau à balais, 847.
—— Commun, 847.
Rosewood, African, 239.
——, Gambian, 239.
——, Senegal, 239.
——, West African, 239.
Rottboellia exaltata, 776.
Rough-skinned plum, 302.
Rounno, 281.
Roupellia grata, 447.
Royal Niger Co.'s Plantations, 35
Rozelle, 74.
—— Hemp, 74.
Rubber, Accra Niggers, 430.
——, Addah Niggers, 430.
——, Alibida, 437.
——, Assam, 623.
——, Brown Cluster, 431.
——, Brown Medium, 431.
——, Ceara, 598.
——, Central American, 636.
——, Conakry Niggers, 430.
——, Congo Red, 430.
——, Elo paste, 434.
——, Flake, 437, 630.
——, Gold Coast Lump, 454.
——, Ivory Coast Lump, 454.
——, Jandunko (Cluster), 430.
——, Kano, 630, 631.
——, Lagos, 453, 635.
——, Lagos Biscuit, 453.
——, Lagos Silk, 453, 454, 456, 458, 637.
——, Lagos Strip 453.
——, Maniçoba, 598.
——, Memeluku, 634.
——, Mexican, 636.
——, Nigger Ball, 430.
——, Nunez Niggers, 430.
——, Ogbagba, 630.
——, Para, 585, 636.
——, Paste, 433, 437.
——, Piauhy, 600.
——, Red Ball, 436.
——, Red Gambia, 630.
——, Red Kano, 630.
——, Root, 431, 436, 437.
——, Thimble, 430.
——, Vine, 430.
——, West African Tree, 453.
Rubiaceae, 343.
Rubia tinctorum, 392.
Rumana, 680.
Rumena, 680.
Rumpat Kakatjangan, 198.
Runda, 358.
Rush Nut, 761.
Rushy-stalked Crotalaria, 181.

Russian Hemp, 183.
Rutaceae, 121.

Saba, 433, 672.
—— fatan, 833.
Sabe or Sabi, 833.
Sabia, 433.
Sabicu, 121.
Sablier, 612.
——elastique, 612.
Sabongo, 50, 179.
Sabral, 198.
Sabual, 219.
Sabulah, 705.
Sacabuche, 487.
Saccharum officinarum, 779.
—— spontaneum, var aegyptiacum, 787.
Sacci, 684.
Sacciolepis interrupta, 836.
Sacqui, 684.
Sacr, 299.
Sacred Palm, 737.
Sadd, 765, 775.
Safa, 705.
Safflower, 392.
Saffron, Bastard, 392.
Safra Kohia, 794.
Safu, 142.
Sagasaga, 209.
Sagere, 450.
Sage, Wild, 516.
Sagga, 582.
Sagona, 433.
Sago Palm, 713, 722.
Sahaba, 308.
Saie, 358.
Sainfoin d'Espagne, 198.
Saingia, 59.
Sakay filo, 490.
Sakpachi, 640.
Sakribonti, 338.
Salacia macrocarpa, 161.
—— senegalensis, 161
Salaga Potato, 531.
Salamba, 261.
Salasile, 510.
Salla, 753.
Salt bush, 427.
Salvadora persica, 427, 428, 763.
Salvadoraceae, 427.
Saman, 300.
Samar, 763.
Sambag, 275.
Sambagui, 275.
Sambalagui, 275.
Sambi-Sambi, 510.
Same, 297.
Sampalok, 275.
Sampfen Wood, 252.
Samr, 508.
Samshu, 802.
Sandbox Tree, 612.
Sandy pot-herb, 341.
Sangantsahandvoliky, 533.
Sango, 629.
Sangol, 52.
Sangoline, 52.
Sannio, 844.
San, Sani or Sanai Hemp, 181.
Sansevieria guineensis, 698, 701.
—— metallica, 698.
—— sp., 699.
—— trifasciata, 698.
—— —— var. Laurentii, 698, 701.
Sant, 288.
Santal Rouge d'Afrique, 239.
Santiriopsis Klaineana, 144.
Santoon, 475.
Saosa, 554.
Sapele Mahogany, 184.
Sapindaceae, 165.
Sapium Jenmani, 415.
Sapodilla, 400.
Sapodilla Plum, 400.
Sapotaceae, 397.
Sapote, 399.
Sapoti, 399.
Sapoti-assi, 399.
Sappan Wood, 252.
Sarala, 816.
Saratani, 253.
Sarcocephalus esculentus, 343.
—— —— var. eu-esculentus, 343.
—— —— —— Russegori, 343.
—— Russegeri, 343.
Sarcophrynium macrostachyum, 667.
Sare guiwa, 514.
Sari-zaba, 822.
Sarwali, 540.
Sasa, 715.
Sasana, 286.
Sasanemasa, 509.
Sasanenasa, 509.
Sassama, 554.
Sassarau Kura, 164.
Sasswood, 278, 279, 521.
Sassy Bark, 279.
Satin Wood, 105.
Sau, 266.
Sauce, Pepper, 491.
Saur, Wild, 70.
Sauvagesia erecta, 157.
Sawala, 653.
Sawar, 634.
Sawewe, 544.
Scarlet Dazzle, 575.
Schbeh, 483.
Schizachyrium exile, 809.

Schleichera trijuga, 222.
Schmidelia africana, 167.
Schoenfeldia gracilis, 854.
Schwenkia americana, 505.
—— hirta, 506.
Sclerosperma Mannii, 713.
Scitamineae, 657.
Scoparia dulcis, 506.
Scotch Grass, 822.
Scratch Coco, 756.
Scrophulariaceae, 506.
Scrubby Oak, 139.
Sea-bean, 282.
Seaside Plum, 157.
Sebesten, 471.
Sechium edule, 339.
Secupira, 280.
Securidaca longipedunculata, 59.
Seed, Circassian, 284.
——, Fantupa, 260.
——, Guilandina, 249.
——, Heart, 165.
——, Jamboo, 201.
——, Jequerity, 209.
——, Metal, 260.
——, Rati, 209.
——, Smooth Heart, 165.
Séfono, 346.
Selsele, 510.
Sembara, 221.
Semen Stramonii, 495.
Semillo de Platanillo, 259.
Senaar Ebony, 238.
Senat, bitter, 334.
——, sweet, 334.
Senecio abyssinicus, 391.
—— baberca, 391.
Senegal Ebony, 238.
—— Gum, 293.
—— Rosewood, 239.
—— Senna, 258.
Senna, 258, 554.
——, Aden, 256.
——, Alexandria, 256.
——, Arabian, 256.
—— baladi, 258.
—— Bombay, 256.
—— Coffee, 259.
——, Country, 258.
——, East Indian, 256.
——, Italian, 258.
——, Jamaica, 258.
—— jebeli, 256.
—— mekké, 259.
——, Mocha, 256.
——, Nubian, 256.
——, Senegal, 258.
——, Small, 259.
——, Spanish, 258.
——, Tea, 258.
——, Tinnivelly, 256.
——, Tripoli, 258.
Sennet, 157.
Sense, 190.
Sensitive Plant, 287.
—— Wood Sorrel, 121.
Senterinko, 232.
Séribéli, 178.
Séri-gbéli, 178.
Seringueira branca, 585.
—— preta, 585.
Serkys Tea, 545.
Serou, 215.
Sesamum indicum, 511.
—— orientale, 511.
—— radiatum, 513.
Sesbania aculeata, 197.
—— aegyptiaca, 198.
—— grandiflora, 553.
—— punctata, 198.
Sese, 452.
Seseru, 510.
Setaria aurea, 836, 838.
—— glauca, var. elongata, 836.
—— italica, 837.
—— rubiginosa, 838.
—— sulcata, 838.
Seville Orange, 122.
Seyal, 295.
Seyana Beans, 201.
Shab-el-leila, 537.
Shadday, 229.
Shaddock, 129.
Shafa, 705.
Shagara-et-fas, 287.
Shama Millet, 830.
Shangaira, 289.
Shan-kaveli, 473.
Shalla, 753.
Shallot, 705.
Shallu, 797.
Shanu, 572.
Shauga, 58.
Shayo, 249.
Shea Butter, 410, 630.
——, Gutta, 410.
—— Toulou, 410.
Shedun, 248.
She-keun-tsze, 312.
Shell-less or Soft Nut, 737.
Shelsheleih, 797.
Sheme, 787.
She Oak, 650.
Shessab, 844.
Shibra, 842.
Shimbera, 208.
Shinaka, 859.
Shinaki, 854.
Shirinia, 628.
Shiro Natamame, 221.
—— Sasage, 229.
Shishibia, 334.
Shittar Wood, 295.
Shittim Wood, 295.

Shoe-flower, 73.
Shokotor, 540.
Shola, 200.
Short-podded Yam Bean, 232.
—— Staple American Cotton, 77, 78.
Shower, Golden, 257.
Shrubby Capsicum, 490.
—— Tobacco, 498.
Shrub, Ringworm, 257.
Shu Camphor, 563.
Shuiaan, 239.
Shuma, 425.
Shura, 842.
Siam Cotton, 78.
—— Teak, 519.
Sibboo Colom, 729.
Sicopira, 280.
Sida carpinifolia, 66.
—— Hemp, 66.
—— rhombifolia, 66.
—— urens, 67.
Sideroxylon dulcificum, 402, 667.
—— longistylum, 402.
Sidipason, 433.
Sie, 296.
Sierra Leone Ebony, 238.
—— Leone Fever plant, 529.
Sifilé, 264.
Sifili, 264.
Sika Tsuntsua, 853.
Sikhtyan, 795.
Sikonkenad, 433.
Siling-Silame, 165.
Silk Cotton Tree, 86.
Silkworm, Eri, 161.
——, Katkura, 306.
——, Tsamian doka, 267.
——, Tsamian fakali, 267.
——, Tsamian tsamia, 276.
——, Tusar, 161.
Silky Cytisus, 180.
Silky Oak, 570.
Siludi, 288.
Silug, 308.
Silveira, 425.
Simarubeae, 136.
Simba Bali, 310.
Simbach, 248.
Sime, 617.
Sim ef Far, 489.
Sim-Sim, 512.
Sina, 273.
Sindru, 443.
Sindura, 444.
Sing, 296.
Singdour, 296.
Singhara nut, 324.
Siphon Gourd, 330.
Sirilinyaxa, 821.
Siris, 299.
Sisal, African, 700.
—— Hemp, 682, 701.
Sita-che-Kes, 474.
Sitao, 229.
Skeken-Sheken-Omoda, 184.
Sloetia sideroxylon, 347.
Small Mauritius Bean, 225.
—— Senna, 259.
—— White Medlar, 361.
Smilax Kraussiana, 702.
Smoke Apple-wort, 494.
Smooth Heart Seed, 165.
Smyrna Fig, 620.
Snakebean, 221.
Snakewood, 467.
Snuffbox bean, 282.
Sõ, 266.
Sobbeure, 208.
Sofar, 295.
Soffar, 295.
Sofo, 346.
Soft Shelled Nut Palm, 736.
Soga Meal, 202, 779.
Soja Bean, 211.
Sokko, 229.
Soko Yokoto, 540.
Sola, 200.
Solanaceae, 480.
Solanum duplosinuatum, 482.
—— —— var. semiglabrum, 482.
—— incanum, 483.
—— Melongena, 483.
—— —— var. inerme, 483.
—— nodiflorum, 484.
—— tuberosum, 485.
Solapith plant, 200.
Solenostemon ocymoides, 530.
Solid or Male Bamboo, 876.
Solum, 261.
Somu, 410.
Sona Mung, 227.
Songue, 302.
Sontag, 181.
Soolay Qua, 331.
Soonud, 289.
Sorgho, 798.
Sorghum, 798.
—— Ankolib, 788.
—— arundinaceum, 788.
—— bicolor, 788.
—— —— var. obovatum, 788.
—— —— —— technicus, 789.
—— caffrorum, 791, 804.
——, California Golden, 797.
—— caudatum, 792.
—— —— var. Feterita, 792.
—— cernuum, 793.
—— Durra, 792, 794, 804.
—— guineense, 795.
—— —— var. involutum, 795.
—— —— robustum, 795.
—— —— tremulans, 795.
—— halepense, 796.
—— lanceolatum, 797.

Sorghum margaritiferum, 797.
—— melaleucum, 797.
—— Roxburghii, 797.
—— saccharatum, 792, 798.
—— sudanense, 800.
——, Sweet, 798.
—— Virgatum, 800.
—— Vogelianum, 801.
—— vulgare, 801, 804.
Sorgo à Sucre, 799.
Soroko, 226.
Sorossi, 333.
Sorrel, Indian, 74.
——, Red, 74.
Souaria, 167.
Soudan Vine, 163.
Soulp, 138.
Soumpa, 138.
Soune, 287.
Sounson, 425.
Sour Gourd, 85.
—— Grass, 808, 809, 824.
—— Lime, 132.
—— Sop, 48.
—— -sour, 74.
South African Red-top, 839.
—— American Cotton, 79.
—— Sea Arrowroot, 688.
Soy Bean, 211, 471, 800.
Spanish Potato, 475.
—— Senna, 258.
Sparganophorus Vaillantii, 378.
Spathodea campanulata, 509.
Spear Grass, 777, 816, 817.
Specimens, Collection of, 18.
Sphaeranthus hirtus, 384.
—— indicus, 384.
Spigelia Anthelmia, 469.
Spiked Millet, 844.
Spilanthes Acmella, 389.
Spinach, Indian, 545.
Spineless Sago Palm, 722.
Spiny Bamboo, 878.
Spirit, Cashew, 176.
Spondias lutea, 177.
—— mangifera, 177.
Spur Pepper, 490.
Spurious Rubber Tree, 452.
Sporobolus festivus, 850.
—— indicus, 850.
—— pyramidalis, 851.
—— spicatus, 851.
Square-Stemmed Passion Flower, 327.
Squash, 483.
Squash Gourd, 338.
Squill, 709.
—— Indian, 709.
Ssehhelib, 732.
Stachytarpheta indica, 518.
Star Apple, 398.
—— Grass, 855.
Starch Bean, 233.
Stenotaphrum americanum, 828.
—— glabrum, 828.
—— secundatum, 828.
Sterculia Barteri, 91.
—— cinerea, 90.
—— rhinopetala, 90.
—— tomentosa, 90.
—— Tragacantha, 90.
Sterculiaceae, 90.
Stereospermum Kunthianum, 508.
Stink Grass, 853.
—— Weed, 494.
—— wort, 494.
Stinking Passion Flower, 326.
—— Weed, 259.
Stizolobium, 216, 217.
St. Augustine Grass, 828.
— John's Bread, 262.
— Lucie Grass, 856.
— Thomas Tree, 265.
— Vincent Arrowroot, 668.
Stone Cotton, 77.
Stoutou, 121.
Strainer Vine, 331.
Stramonium, 494.
Strophanthin, 448.
Strophanthus Barteri, 446, 450.
—— Emini, 449.
—— gratus, 447.
—— hispidus, 267, 448, 452.
—— Kombe, 449, 452.
—— Preussii, 449, 450, 458.
—— sarmentosus, 450.
—— Thollonii, 449.
Strychnine Tree, 467.
Strychnos Nux-vomica, 467.
—— spinosa, 468.
—— —— var. pubescens, 468.
Styptic Weed, 259.
Suakim Gum, 295.
Suarki, 427.
Subar, Black, 310.
Subaris-wad, 310.
Subi grande, 669.
Sucupira, 280.
Sudan Grass, 800.
Sudd, 766, 775.
Suddite, 765.
Sugar-apple, 49.
—— Bean, 225.
—— Beet, 546.
—— Cane, 779.
—— Cane Wax, 780.
—— Palm, 713.
—— Sorgo, 798.
Sukum, 642.
Sui, 231.
Sulla, 198.
Sulunji, 777.
Sumach, American, 250.
Sumáque-Amriquah, 250.

Suma-Uma, 87.
Sumffigi, 832.
Sundutundu, 721.
Sunflower, 386.
Sunn Hemp, 183.
Swallow-Wort, Curassavian, 464.
Swamp Mahogany, 617.
—— Oak, 650.
Swartzia madagascariensis, 248.
Swazi, 273.
Sword Bean, 221, 282.
Sweet Basil, 527.
—— Cassava, 601.
—— Corn, 770.
—— Grass, 807, 858.
—— Sorghum, 798.
—— Melon, 334.
—— Orange, 122.
—— Pigweed, 545.
—— Potato, 475.
—— Senat, 334.
—— Scented Garland Flower, 658.
—— Sop, 49.
Sword-leaf Tobacco, 499.
Syala, 653.
Symphonia globulifera, 62.
Synsepalum dulcificum, 402.
Syrian Cotton, 77.
—— Grass, 796.

Tabaca bianca, 614.
Taban, Gutta, 403.
Taban, Merah, 403.
Taba-nika, samu, 634.
Tabasco, 491.
Tabba, 497.
Tabernamontana Barteri, 444.
—— durissima, 444.
—— pachysiphon, 444.
Taccaceae, 688.
Tacca Arrowroot, 688.
—— involucrata, 688.
—— pinnatifida, 688.
Tacúla, 243.
Tafarnuwa, 708.
Tafasiya, 343.
Tafassa, 260.
Tagasaste, 180.
Tag Hemp, 181.
Tagum, 192.
Tahme, 402.
Taiski, 788.
Takanda, 798.
Takanda giwa, 342.
Ta-kir-ni, 297.
Talban, 859.
Talca Gum, 295, 296.
Talch, 295.
Talh abiad, 295.
Talh Gum, 295.
Talha, 295.
—— Talha Gum, 295, 296.
Talinum triangulare, 61.
Talisay, 306.
Talka Gum, 295.
Talla, 855.
Tallow Nut, 157.
—— Tree, 63, 277.
Talong, 483.
Tamakwa, 558.
Tamarind, 275.
——, Black, 261.
——, Indian, 275.
——, Velvet, 261.
Tamarindeiro, 275.
Tamarindo, 275.
Tamarindus indica, 275.
Tam Assurba, 402.
Tamba, 859.
Tambac, 497.
Tambakombako, 381.
Tamba Millet, 859.
Tambarib, 263.
Tambobo, 507.
Tambookie Grass, 814, 817.
Ta-meer-umboi, 335.
Tamia-caspi, 300.
Tampinis, 347, 519.
Tamr hindee, 275.
Tanahon, 253.
Tanggoeli, 257.
Tangma, 614.
Tania, 757.
Tanjong, 420.
Tannier, 757.
Tapioca, 601.
Taraiya, 240.
Tarbar, 540.
Tarbooj, 336.
Tari, 237.
Taro, 756.
Tartar Tree, 90.
Tasbi, 670.
Tataramoa, 249.
Taubin, 729.
Tawasa, 283.
Tawi, 226.
Tawra, 277.
Tawri, 198.
Tawry, 196.
Tchenga, 289.
Tchioge, 510.
Tchou Ma, 646.
Tea-bush-leaf, 529.
——, Gambia, 517.
——, Mexican, 545.
—— Plant, 66.
——, Senna, 258.
——, Serkys, 545.
Teak, 426, 519, 651.
——, Bastard, 222.
——, Borneo, 519.

Teak, Burma, 519.
——, Eng, 519.
——, Indian, 519.
——, Papuan, 520.
——, Siam, 519.
——, Yang, 519.
Tecoma leucoxylon, 133.
Tectona grandis, 426, 519, 651.
Tedgir, 552.
Teff Grass, 851.
Tek, 519.
Teka, 519.
Tekku, 519.
Teku, 519.
Telebun, 859.
Telfairia occidentalis, 329.
—— pedata, 329.
Telimu, 215.
Tema, 617.
Tembi, 726.
Temeng-Temeng, 353.
Tendsee, 336.
Tené, 534.
Tengah, 304.
Tengbu, 614.
Teosinte, 767.
Tephrosia purpurea, 195.
—— Vogelii, 156, 196.
Terai, 878.
Tera Yayu, 688.
Terblanz, 569.
Terminalia avicennioides, 306.
—— Catappa, 65, 306.
—— macroptera, 307.
—— sp., 308.
—— superba, 307, 657.
—— togoensis, 307.
Terra Japonica, 347.
Téteré, 343.
Tetracera, 47.
—— alnifolia, 47.
—— potatoria, 47.
Tetrapleura Thonningii, 284.
Teturian, 258.
Thanat, 470.
Thaumatococcus Danielli, 93, 666.
Thé du Mexique, 544.
Thelepogon, elegans, 775.
Themeda quadrivalvis, 817.
—— Forskalii, 817.
—— —— var. mollissima, 818.
—— triandra, 817.
Theobroma bicolor, 96.
—— Cacao, 96.
—— pentagona, 96.
Thevetia neriifolia, 439.
Thievi, 271.
Thimble Rubber, 430.
Thin Shell Nut Palm, 736.
Thistle, Blessed, 392.
——, Yellow Distaff, 392.
Thome, 708.
Thondo, 239.
Thonningia sanguinea, 571.
Thorn Apple, 494.
——, Black, 292.
——, Buffalo, 162.
——, Cut, 162.
——, Egyptian, 289.
——, Jerusalem, 253.
Thunbergia erecta, 514.
—— Vogeliana, 514.
Thymelaeaceae, 571.
Ticaro, 507.
Ticla, 519.
Tie-Tie, 726.
Tiger Cacao, 98.
—— Nut, 761.
Tigwi, 584.
Til, 511, 512.
Tilam Wangi, 535.
Tiliaceae, 105.
Tilleul d'Afrique, 346.
Timbo, 166.
Timothy, 801, 839, 856, 857.
——, Rhodesian, 836.
Tindlohu, 232.
Tingingi, 398.
Tingué, 470.
Tinnea aethiopica, 536.
Tinnivelly Senna, 256.
Tinya, Tunya or Tinia, 578.
Tiru Calli, 576.
Tirukalli, 576.
Tita Dhoondool, 331.
Tobacco, Broad-leaf, 498.
——, East Indian, 496.
——, Havana, 498.
——, Large-leaved, 499.
——, Latakia, 498, 499.
——, Narrow-leaved, 498.
——, Shrubby, 498.
——, Sword-leaf, 499.
——, Turkish, 496.
——, Virginia, 499.
Tofa, 777.
Toga, 768.
Togan, 332.
Toja, 68.
Toha, 777.
Toke, 448.
Tomagarika, 850.
Tomato, 480.
——, Hyaenás, 483.
—— de la Paz, 488.
——, Plum, 488.
——, Tree, 488.
Tomatu, 480.
Tomba, 859.
Tombi, 275.
Tombigui, 275.
Tomboka, 484.
Tombo Palm, 724, 725.
Tomburong, 162.

Tomi, 275.
Tonam, 156.
Tonasu, 338.
Tonga Bean, 235.
Tongue, Woman's, 299.
Tonjatula, 389.
Tonje-manga, 78.
Tonke, 160.
Toolsi, 208.
Toong goojah, 482.
Toongueeza, 482.
Toorf, 543.
Tooth-brush tree, 427.
Topee-Tambou, 669.
Tora, 634.
Torbor, 540.
Tortoza, 580.
Totowe, 631.
Touckpong, 415.
Touloucouna Oil, 150.
Toung Thanat, 470.
Toungué, 470.
Tous les Mois, 670.
Tow-Cok, 229.
Towel Gourd, 331.
Tragacanth, 91.
Tragacanth, African, 90.
Transport, 13.
Trapa bispinosa, 324.
—— natans, 324.
Treculia africana, 639.
Tree, African Tulip, 510.
——, Auricula, 463.
——, Bead, 145.
——, Bitters, 381.
——, Brimstone, 374.
——, Bullet, 415.
——, Bully, 399, 415.
——, Butter, 409.
——, Calabash, 507.
——, Chaste, 525.
——, Chick Stone, 249.
——, Coco Plumb, 301.
——, Copal, 269.
——, Cork, 85.
—— Cotton, 76, 77.
——, Cotton, 87.
——, Cream of Tartar, 85.
——, Crab, 148.
——, Ebony, 238.
——, Exile, 440.
——, Fat Pork, 301.
——, Flame, 253.
——, Gulmohr, 253.
——, Gum Chicle, 400.
——, Indian Coral, 214.
——, Jasmine, 442.
——, Kavika, 320.
——, Madura Shade, 197.
——, Male Rubber, 446.
——, Mahogany Bark, 121.
——, Melon, 328.
Tree, Monkey Bread, 85.
——, Moorka, 214.
——, Mustard, 427.
——, Nicaraguan Shade, 197.
—— of Paradise, 145.
——, Palaver, 471.
——, Peach, 168.
——, Pudding Pipe, 257.
——, Rain, 300.
——, Red Bead, 284.
——, Red Water, 279.
——, Silk Cotton, 86.
——, Spurious Rubber, 452.
——, St. Thomas, 265.
——, Strychnine, 467.
——, Tallow, 277.
——, Tartar, 90.
——, Tomato, 488.
——, Tooth brush, 427.
——, Trumpet, 496.
——, West Indian Bead, 145.
Trefoil, Burgundy, 186.
Trema guineensis, 613.
Trianthema monogyna, 341.
—— pentandra, 341.
Trichilia emetica, 146, 418.
—— Heudelotii, 148.
—— Prieuriana, 148.
Trichodesma africanum, 472.
Tricholaena rosea, 838.
—— sphacelata, 839.
Trichopterya hordeiformis, 847.
—— naigritiana, 846.
—— simplex, 847.
Trifolium alexandrinum, 187.
—— semitriloba, 106.
Triplochitonaceae, 104.
Triplochiton Johnsonii, 104.
—— nigericum, 105.
—— sp., 105.
Tripol, 199.
Tripoli Senna, 258.
Triticum durum, 870.
—— —— var. leucurum, 870.
—— sativum, 870.
—— vulgare, 870.
Triumfetta cordifolia, 106.
—— —— var. Hollandii, 106.
—— —— var. tomentosa, 106.
—— —— var. typica, 106.
—— rhomboidea, 106.
—— semitriloba, 596.
Tropical Almond, 306.
True Hemp, 181.
Trumpet Tree, 496.
Truxillo Coca, 117.
Tsabre, 811.
Tsah, 584.
Tsakara, 755.
Tsama Water Melon, 336.
Tsamia, 275.
Tsamian doka silkworm, 267.

Tsamian fakali silkworm, 267.
—— tsamia silkworm, 276.
Tsar-Kiyar Zomo, 855.
Tsaure, 811.
Tscheschun, 256.
Tschischiva, 256.
Tsidaun Kare, 712.
Tsikar daji, 815.
—— dawa, 815.
Tsikiri, 146.
Tsikirity, 354.
Tsintsiya, 853.
Tsintsiyar Kogi, 849.
Tsirkiar, 855.
Tsitiamoty, 106.
Tsumbi-lumi, 381.
Tsuntsia or Tsintsiya, 832.
Ttheff, Tteff or Thaff, 851.
Tuba, 593.
Tubatuba, 593.
Tucula, 243.
Tuberculated Momordica, 333.
Tuji, 860.
Tukuruwa, 724.
Tulipier du Gaboon, 510.
Tuma da goboro, 815.
Tumbin Jaki, 827.
Tumble Tree of Sierra Leone, 261.
Tumbuku, 531.
Tumfafia, 463.
Tumuku, 531.
Tumukum biri, 530.
Tung Kuan, 484.
Tunis Grass, 800.
Tupe, 282.
Turadi, 763.
Turari, 760.
Turi-abang, 198.
Turkey Gum, 293.
Turkish Tobacco, 496.
Turmeric, 659.
——, Long Rooted, 659.
Turnsole, Indian, 472.
Tururibi, 571.
Tusar Silkworm, 161.
Tusore, 74.
Tussock Grass, 850.
Tuwon biri, 691.
Tweek Grass, 828.
Typha australis, 753, 765.
Typhaceae, 753.
Tzontzo, 274.
Tzu hua, 484.

Uaixyma, 68.
Uala, 475.
Uango, 301.
Uanguilla, 512.
Uapaca guineensis, 581.
—— Heudelotii, 581.
—— Staudtii, 582.
Uba, 779.
Ubabikpan, 435.
Ubachie, 431.
Ubakae, 431.
Ubake, 436.
Ubamiogon, 430, 433.
Ubanikwi, 437.
Ubaniogon, 462.
Ube, 690.
Ubellu, 584.
Uboikwankwan, 430.
Ubu, 444.
Udid, 226.
Udika, 137.
Udin, 735.
Uerek, 293.
U-Gagaan, 286.
Uganda Clover, 824.
—— Grass, 855.
Ugbo, 430.
Ughahan, 121.
Uhu, 443.
Uimbe, 859.
Uique, 399.
Ujea, 270.
Ujia, 269.
Ujio, 137.
Ukhu, 443.
Ukoko, 79.
Ukopie, 398.
Ukot, 723.
Ukpe Lorphua, 167.
Ukpi Nufwa, 167.
Uluzi, 629.
Umakhu, 711.
Umara, 475.
Umbharanta, 620.
Umbindoio, 525.
Umbondive, 530.
Umbrella Tree, 641.
Umlolwa, 75.
Ume, 241.
Umfubu, 626.
Um-Hlala, 468.
Umkonza, 429.
Umkuana, 839.
Um-Kuhlu, 146.
Um-Llandhloti, 298.
Um-Llandoti Nebelele, 298.
Umpafa, 162.
Umpanda, 274.
Umpeque, 157.
Um-Pegembetu, 190.
Umsosoti, 584.
Umtombe, 629.
Umtuem, 397.
Umtuma, 482.
Umvelli-Velli, 844.
Uncaria Gambier, 346.
Undai, 358.
Unscented Mahogany, 151.
Unweriotan, 116.

Unwonnen, 607.
Unwonwe, 607.
Unyoro Ebony, 238.
Upland Cotton, 78.
Upoko, 859.
Uraria picta, 206.
Urd, 226.
Urena lobata, 68, 111, 535.
—— sinuata, 69.
Urera obovata, 646.
—— —— var. Quintasii, 646.
Urginea altissima, 709.
—— indica, 709.
—— maritima, 709.
Urochloa insculpta, 829.
Ursusa, 626.
Ushar, 463.
Usher, 463.
Utantan, 297.
Uvaria Chamae, 49.
Uwar Yara, 619.
Uweheyota, 116.
Uwenvwen, 607.
Uwondwe, 838.

Vacoa, 753.
Vahimpasika, 473.
Vahindanigo, 354.
Vahivoraka, 549.
Vallisneria spiralis, 653.
Vandellia diffusa, 506.
Vangueria Dalzielii, 360.
—— edulis, 360.
—— esculenta, 361.
—— Manjiro, 361.
Vanilla, 654.
—— planifolia, 594, 653.
Varach, 301.
Variegated Alfalfa, 186.
Vedi Babul, 290.
Veeazee, 475.
Vegetable Mercury, 488.
—— Marrow, 338.
—— Pear, 340.
—— Sponge, 331.
Velvet Bean, 218.
—— Leaf, 52.
—— Tamarind, 261.
Venetian Whisk, 789.
Verbenaceae, 516.
Verek, 293.
Vernonin, 380.
Vernonia amygdalina, 379.
—— cinerea, 379.
—— Kotschyana, 380.
—— nigritiana, 380.
—— Perrottetii, 380.
—— senegalensis, 380.
Vervain, Bastard, of Jamaica, 518.
Vetiver, 807.
Vetiveria nigritana, 806.
—— zizanioides, 806.
Vetivert, 807.
—— Root, 807.
Viélo, 232.
Vigna Catiang, 99, 800.
—— Catjang, 228.
—— luteola, 230.
—— nilotica, 230.
—— sinensis, 228.
—— triloba, 231.
Viku, 343.
Vine, Balloon, 165.
——, Djenge, 432.
——, Edible Stemmed, 164.
—— -leaved Cotton, 80.
—— Rubber, 430.
—— Soudan, 163.
——, Strainer, 331.
——, White Rubber, 430.
Violarieae, 57.
Virginian Snake Root, 552.
Virginia Tobacco, 499.
Vishnukránta, 473.
Vistnukrandi, 473.
Vitex Agnus-Castus, 525.
—— Cienkowskii, 525.
—— cuneata, 526.
—— diversifolia, 526.
—— Fosteri, 526.
—— grandifolia, 526.
—— megaphylla, 526.
Vitis aralioides, 163.
—— bombycina, 163.
—— caesia, 163.
—— cornifolia, 163.
—— Lecardii, 163.
—— Leonensis, 164.
—— pallida, 164.
—— palmatifida, 164.
—— quadrangularis, 164.
—— Schimperiana, 165.
Vjyetjo, 729.
Voacanga africana, 445.
Voahazo, 512.
Voakètsihètsy, 336.
Voamitza, 531.
Voandaingo, 354.
Voandzeia Poissoni, 231.
—— subterranea, 231.
Voandzobory, 232.
Voa-Vanga, 360.
Voavotaka, 468.
Volvaria esculenta, 881.
Vossia cuspidata, 775.
Votchi, 737.
Vouandzou, 232.
Vuakania, 737.

Wa, 622, 631.
Wa Batako, 382.
Watchen-betje, 702.
Waiyaro, 575.
Wake-n-damfammi, 236.
—— —— turawa, 236.
Wala, 452.
Wal-del, 645.
Walnut, 248.
——, Country, 595.
——, East Indian, 299.
——, Indian, 595.
Waltheria americana, 95.
Warted Crotalaria, 185.
Water Caltrops, 325.
—— Chestnut, 325.
—— Coco-Nut Palm, 715.
—— Grass, 822.
—— Lemon, 327.
—— Lettuce, 754.
—— Melon, 336.
—— Soldier, 754.
Waterways and Rivers, 4.
Watuje, 761.
Wax Gourd, 332.
—— Karamanni, 62.
——, Sugar Cane, 780.
Wedge-leaved East Indian Crotalaria, 184.
Wedwedwi, 382.
Weed, Caesar, 68.
——, Jimson, 494.
——, Licorice, 506.
——, Stinking, 259.
——, Styptic, 259.
Were, 196.
West African Blackwood, 238.
—— —— Indigo, 244.
—— —— Locust Bean, 281.
—— —— Mahogany, 155, 346.
—— —— Rosewood, 239.
—— —— Tree Rubber, 453.
—— Indian Arrowroot, 668.
—— —— Bay, 316.
—— —— Bead Tree, 145.
—— —— Cow-itch Plant, 220.
—— —— Filbert, 282.
Wheat, 870.
——, California, 797.
——, Egyptian, 797.
——, Mexican, 797.
White Button Wood, 309.
—— Cedar, 133.
—— Cinnamon, 316.
—— Durra, 794.
—— Gourd, 332.
—— —— Melon, 332.
—— Gram, 211.
—— Mahoe, 73.
—— Mangrove, 309, 527.
—— Oil Palm, 735.
—— Pumpkin, 330.
White Rubber Vine, 430.
—— Silk Cotton, 87.
—— Yam, 690, 691.
Wild Almond, 306.
—— Amaranth, 540.
—— Ass Grass, 813.
—— Bread Fruit, 645.
—— Cinnamon, 316.
—— Coffee, 259, 355.
—— Jasmine, 658.
—— Lime, 157.
—— Mango, 137, 169.
—— Negro Ipecacuanha, 464.
—— Nutmeg Tree, 558.
—— Oats, 816.
—— Olive, 157.
—— Rapoko Grass, 861.
—— Rice, 830.
—— Sage, 516, 517.
—— Saur, 70.
—— Tea Bush, 536.
—— Water Lemon, 326.
Wildfire bush, 494.
Window-calyxed Crotalaria, 181.
Wine Palm, 723, 724.
Winged leaved Ipomoea, 474.
Winter Cherry, 165.
Wire Grass, 849, 855.
Wissadula rostrata, 67.
Withania somnifera, 489.
Wiyan demmu, 310.
Woacroolie, 343.
Womagunguna, 59.
Woman's tongue, 299.
Wongo, 73, 75.
Wonton, 616.
Wood, African Grendilla, 238.
——, Bakam, 252.
——, Billet, 424.
——, Brazilian, 252.
——, Brimstone, 308, 375.
——, Bullet, 416.
——, Button, 308.
——, Coral, 284.
——, Ebony, 238.
——, Iron, 274.
——, Mochi, 214.
——, Mootchie, 214.
—— Oil, 271.
——, Red Sandal, 284.
——, Sampfen, 252.
——, Sappan, 252.
——, Satin, 105.
——, Shittar, 295.
——, Shittim, 295.
—— Sorrel, Sensitive, 121.
——, White Button, 309.
——, Yellow, 440.
——, Zebra, 179.
Woolly Carthamus, 392.
—— Pyrol, 226.
Worm Grass, 469.

Wormseed, American, 545.
Wort, Gigantic Swallow, 463.
Wowo ?, 167.
Wuchiar Giwa, 847.
Wutsiar, 859.
Wutsiyar giwa, 847.
—— Jaki, 849.
—— Kurege, 849.
—— Kasa, 859.
Wyaka, 232.

Xanthosoma Mafaffa, 757.
—— sagittifolium, 757.
Ximenia americana, 157.
Xina, 273.
Xipepe, 51.
Xylopia aethiopica, 50, 96, 179.
Xysmalobium Heudelotianum, 464.

Ya, 400, 410.
Yadia, 466.
Yahhop, 464.
Yaka, 232.
Yako, 480.
Yakua, 74.
Yalo, 483.
Yam a tout ans, 693, 694.
Yam, 690, 691, 693.
——, Affon or Affoo, 693.
——, Baba-on-le, 690.
——, Barbados, 690.
——, —— Lisbon, 696.
——, Bean, 233.
——, Ben, 690.
——, Bragging Tom, 690.
——, Bullet Tree Hard, 690.
——, Cap, 690.
——, Coco, 695, 756.
——, Connie, 694.
——, Danda, 691.
——, Duck, 690.
——, Eight Months Guinea, 691.
——, Flour, 690.
——, Greater, 690.
——, Guinea, 690, 691.
——, Horn, 696.
——, Lucea, 691.
——, Moonshine, 690.
——, Negro, 691.
——, Oblong Hard, 690.
——, Pinguin, 690.
——, Potato, 691.
——, Pucka, 690.
——, Red, 690, 696.
——, Reuter, 690.
——, Silver, 690.
——, Snake, 690.
——, Ten Months, 690.
——, Twelve Months, 694.
Yam, Two Sisters Hard, 690.
——, Water, 690.
——, White, 690, 691.
——, White Manila, 690.
——, Wing-stalked, 690.
——, Yellow, 694.
Yamma or Yama, 814.
Yanbama, 842.
Yane or Yani, 824.
Yang Teak, 519.
Yankoma, 640.
Yaray, 554.
Yard Grass, 861.
Yarney, 680.
Yaro, 575.
Yaryah yaryah, 345.
Yar-yar, 345.
Yate, 519.
Yati, 519.
Yautia, 756, 757.
—— Malanga, 756.
Yawa, 524.
Yawki, 445.
Yaxci, 682.
Yaya, 345.
Yekathit, 215.
Yellow Bark, 349.
—— Distaff Thistle, 392.
—— Fever Root, 343.
—— Gbeyido, 51.
—— Oleander, 440.
—— Spanish Plum, 177.
—— wood, 440.
Yendi, 632.
Yerba Moro, 807.
—— de quinino, 583.
Yerepe, 220.
Yeye, 581.
Yinyamhi, 244.
Yoay pyoothan, 209.
Yofoni, 830.
Yohimbe, 352.
Yoruba Indigo, 244.
Yuan Tow, 211.
Yuca, 600.
Yue-wyiam, 736.
Yugao, 330.
Yundahl, 483.
Yun-yun, 385.

Zabo, 704.
Zaboko, 704.
Zabon dafi, 704.
Zaccone, 138.
Zachun, 138.
—— Oil, 138.
Zacon, 138.
Zakami, 493.
Zaki banga, 542.
—— banza, 512.

Zakwondiam, 541.
Zamang, 300.
Zamarke, 198.
Zana, 806.
Zanchi, 239.
Zanthoxylum senegalense 121.
Zanzibar Ebony, 425.
Zapote Chico, 400.
Zaragova, 308.
Zauga-vara, 284.
Zawa, 139.
—— Oil, 140.
Zea Mays, 768.
Zebra Wood, 179.
Zindi, 310.
Zing, 296.
Zingiber officinale, 664.
Zinyamunga, 842.
Zizyphus Jujuba, 161.
—— mucronata, 162.
—— Spina-Christi, 163.
Zoet Grass, 858.
Zornia diphylla, 206.
Zovobib, 483.
Zulu Nut, 761.
Zurma, 608.
Zuwoh, 613.
Zwinga, 779.

Printed under the authority of His Majesty's Stationery Office
By Eyre and Spottiswoode, Ltd., East Harding Street, E.C. 4.
Printers to the King's most Excellent Majesty.

[Crown Copyright Reserved.]

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION

ADDITIONAL SERIES IX.

THE USEFUL PLANTS OF NIGERIA,

including Plants suitable for Cultivation in West Africa and other Tropical Dependencies of the British Empire.

BY

J. H. HOLLAND, F.L.S.,

Assistant in the Museums, Royal Botanic Gardens, Kew.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

To be purchased through any Bookseller or directly from
H.M. STATIONERY OFFICE at the following addresses:
IMPERIAL HOUSE, KINGSWAY, LONDON, W.C. 2, and 28, ABINGDON STREET, LONDON, S.W. 1;
37, PETER STREET, MANCHESTER; 1, ST. ANDREW'S CRESCENT, CARDIFF;
23, FORTH STREET, EDINBURGH;
or from EASON AND SON, LTD., 40 and 41, LOWER SACKVILLE STREET, DUBLIN.

1922.

Price £1 8s. Net.

INTRODUCTION.

The first step in the botanical survey of a given area is the field exploration of the vegetation and the accumulation of material for cabinet study. This material must include specimens adequate for the determination and description of the component species, together with illustrative examples of the useful products any of these species yield. The authentic data thus supplied should be accompanied by notes made on the spot for the purpose of enabling herbarium and museum workers to reach approximately reliable scientific and economic conclusions.

Even under the most favourable circumstances field-study is so conditioned that its results can only be attained by degrees. The more thorough that study is, the longer its completion is delayed. Moreover, convenience may dictate or accident demand descriptive treatment of collections formed during an individual season or a particular expedition. The scientific interest and commerical value of such partial contributions are often great. But the piece-meal discussion of the vegetation of a region is attended by the disadvantage that its results, scattered throughout a host of publications not everywhere easily accessible, and based on testimony not always uniform, become difficult to reconcile. Further action is therefore necessary.

The second step in a botanical survey, taken as soon as the material available can be regarded as fairly representative of the vegetation of the area concerned, is the preparation of a systematic census of the constituent plants. Such a work, however, must be more than a serial list of the species enumerated. It must provide a record of the localities in which each species has been met with, and supply descriptions sufficiently precise to enable those who use the work to identify the species in the field. It should afford in addition the seasonal and environmental data required by the student of plant-associations, and refer for the benefit of commerce and industry to properties ascertained or reputed in respect of particular species. Divergence of view in earlier partial floristic studies must be recorded even when it cannot be explained.

If field-exploration be merely a means to floristic study, the latter in turn is only a means to further ends. If carried out conscientiously it ought to supply the taxonomist with hints as to the affinities of plants in general; assist the monographer of special families or genera, and the student of plant distribution; provide the investigator of plant environment with information on which to base sound conclusions, and enable the applied biologist to further economic ends.

The *Flora of Tropical Africa*, the preparation of which has occupied much of the attention of the herbarium staff at Kew for more than half a century and the completion of which at last appears to be in sight, provides an instance of prolonged

x (78)13721 Wt 33313—30/745 225 5/22 E & S

floristic study designed to serve these various ends. With the object of furthering more effectively the last of the purposes mentioned it was resolved, fifteen years ago, to undertake in the museums at Kew the preparation of a manual based on this *Flora* which might enable those using it to concentrate their attention more especially on tropical African plants known to yield useful products.

When considering what the limits of such a work should be it was decided that an attempt to cover the whole of the area served by the *Flora* was uncalled for. So far as the eastern half of Tropical Africa was concerned the authorities responsible for the administration of the territories formerly known as German East Africa, alive to the advantage of such a work, had already arranged for the preparation of an economic survey of the vegetation of that colony issued in 1895 and based on the floristic results published by Kew. This action synchronised with the less systematic efforts of Belgian authors to indicate the economic vegetable resources of the Congo State and only followed the example set by the Conde de Ficalho in 1884 when he published his *Plantas uteis da Africa Portugueza*, a work partly inspired by the information given by R. Brown in 1818 in an appendix to the narrative by Captain Tuckey of an expedition to explore the River Zaïre.

It was realised therefore that, so far as Nyasaland, Uganda and Kenya are concerned, administrative officers interested in the economic vegetable products of their districts already had assistance at their command and that the first duty of the establishment at Kew was rather to provide for the needs of their West African colleagues. The further question as to whether the projected work for West Africa should endeavour to deal with the vegetable resources of all the British Colonies there or be limited to some particular dependency was largely determined by the circumstances that Mr. J. H. Holland, Assistant in the Museums at Kew, was the officer who responded to the invitation to undertake the task. Mr. Holland's African service had been rendered wholly in Nigeria, and the full utilisation of his first-hand knowledge of the vegetation of that important Dependency made it desirable that he should limit his attention to the economic vegetable resources of that Colony. To the fulfilment of this task Mr. Holland has devoted the bulk of his non-official time for the past sixteen years: Part I. was published in 1908, Part II. in 1911 and Part III. in 1915. At this stage His Majesty's Government found it necessary to suspend the publication of Part IV., which completes the work. This embargo, which explains the interval that separates the issue of Parts III. and IV., has now been removed, and it is already known that officers administering the colonies of the Gold Coast and Sierra Leone find *The Useful Plants of Nigeria* as helpful to them as their Nyasaland colleagues find Ficalho's *Plantas uteis* or their colleagues in Uganda and Kenya find *Die Pflanzenwelt Ost-Afrikas*.

D. Prain.

1 Feb. 1922.

PREFACE.

The accompanying account of Nigerian Economic Plants has been complied with the object of supplying in an accessible form the information regarding all the useful plants—native and introduced—known to occur in the region under consideration. Much has been published regarding these plants at different times and in various places, and it is hoped that by bringing together all that is known as to their value, Officers in His Majesty's Service, Traders, Travellers and all whom duty or inclination may call to the country, may have in a connected form the means of readily obtaining a knowledge of the subject. Those who wish to go more deeply into the matter than the present work does, may, it is hoped, find that the copious references given will enable them to do so.

The Genera Plantarum (Bentham & Hooker) is followed as regards the sequence of arrangement of the Families and Genera; the Species are arranged alphabetically and the Index Kewensis is largely taken as the authority for the scientific names. In cases where botanical descriptions can be conveniently referred to in the Flora of Tropical Africa it has not been considered necessary to reproduce them, for it is assumed that this Flora, to which the present work is intended as an Economic complement, will be in the hands of everyone who may study the subject; but when plants belonging to Nigeria are not described in the Flora, a description, taken either from its original or a more convenient source, is given herein. No responsibility is accepted for native names, which are quoted with the authority in italics. Articles bearing on the subject that have already appeared in the Kew Bulletin are quoted freely or with such modifications as appeared necessary or advisable.

Embodied in the work are references to plants that have been figured in the Botanical Magazine (abbreviated "Bot. Mag.") through a long period of years (the publication began in 1787) obtained by collectors in West Africa and cultivated at Kew or in other Botanic Gardens, and in a few instances, raised in Private Gardens in this country. Though chiefly of horticultural value, they are in many cases of economic value and some are of commercial importance.

References to illustrations of the plants mentioned are given wherever this has been found possible, together with references to books and important articles that have appeared in periodicals devoted to plants. These specific works it has not been considered necessary to enumerate again, as it is hoped that the

particulars already given will prove adequate; but a list of books and papers—in chronological order—of general interest (Appendix I. p. 882) as foreshadowed on p. 12 has been extended to cover the whole of West Africa, and, although every effort has been made to include as many authors as possible, it is not submitted as exhaustive. The important subjects of Mycology and Entomology are reserved for other hands; moreover, the remarkable developments in these important branches of Agriculture, during the last decade or so, afford ample ground for abandoning the original intention to include at least some details as to diseases of cultivated plants.

Before dealing with the plants themselves it seemed desirable to say something with regard to the Geography—physical and political—of the area in which they occur and to deal briefly with other cognate subjects bearing on the Botanical, Agricultural, and Forestal development of the country.

I have to acknowledge most gratefully all the invaluable assistance I have received from my colleagues at Kew—in the Herbarium, the Museum and the Gardens. On no one of the many occasions when help has been sought have I asked in vain. To Prof. Craib, M.A., F.L.S., who has since left Kew to take up the Professorship of Botany at the University of Aberdeen, I am especially indebted for assistance at the time that most difficult Order Leguminosae was in hand, in the course of which he was responsible for several new species and, together with Dr. Stapf, F.R.S., for the new genus *Isoberlinia* (see p. 266). I am further indebted to Mr. I. H. Burkill, M.A., F.L.S., Director of the Botanic Gardens, Singapore, for assistance with the Dioscoreas (p. 689) and likewise to Mr. N. E. Brown, A.L.S., who has since retired from the Kew Staff, for advice on certain of the Asclepiads (p. 462) and *Sansevieria* (p. 698).

J. H. HOLLAND.

Royal Botanic Gardens, Kew,
Feb. 1922.